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1959 - 1980

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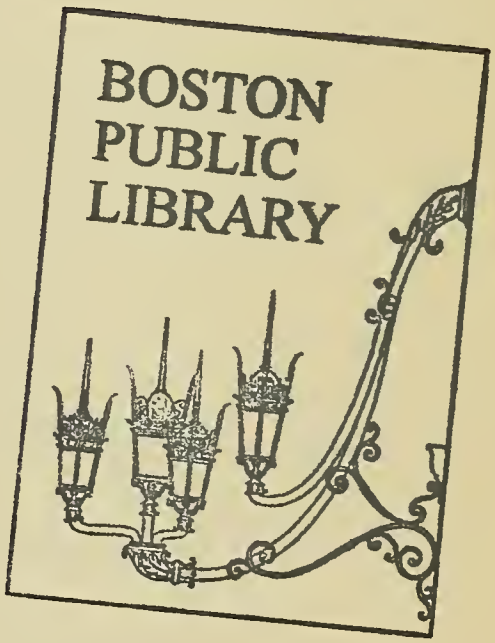

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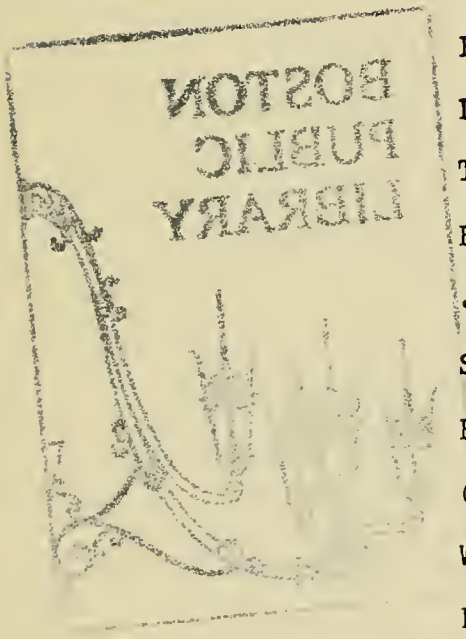

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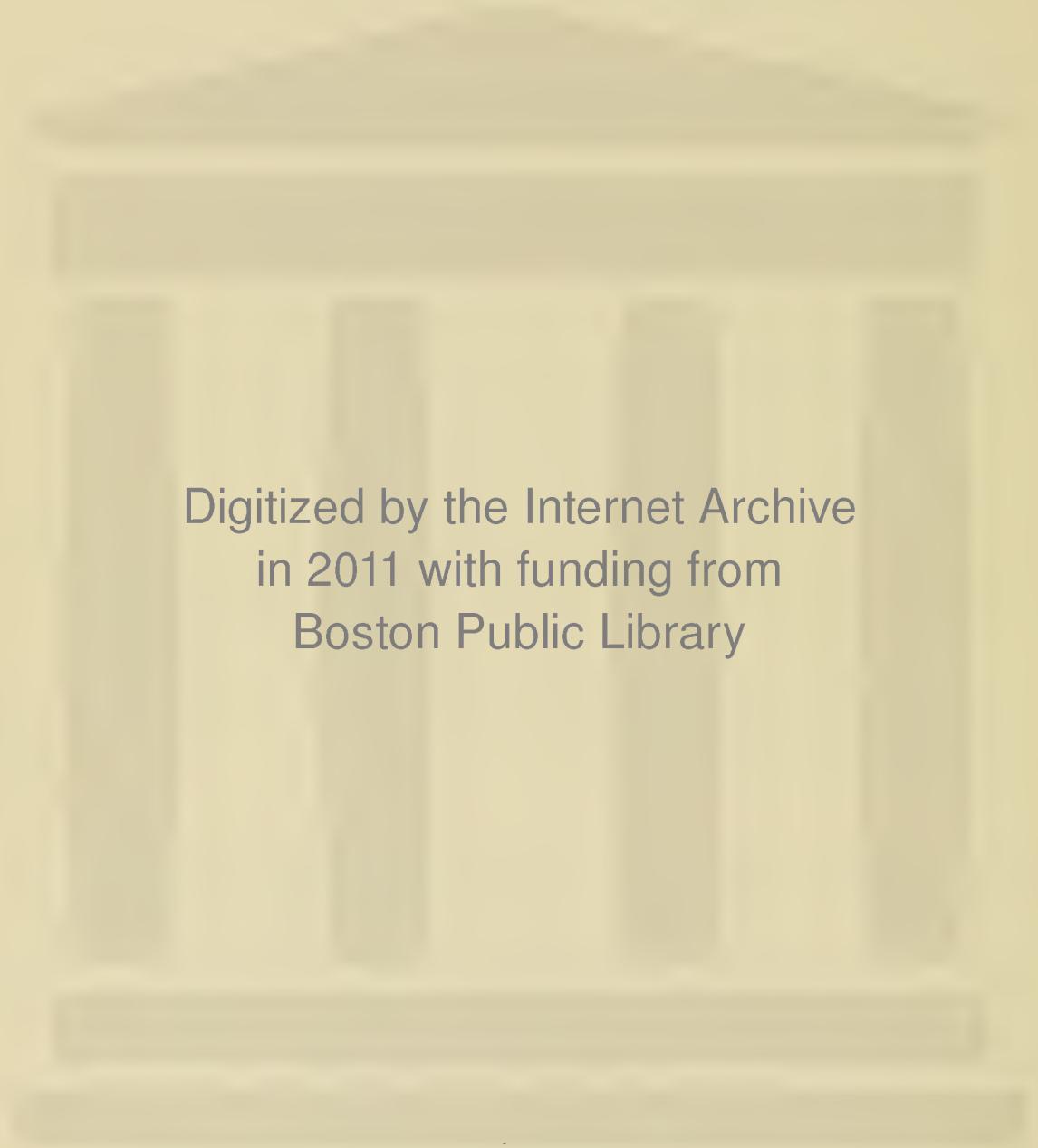

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PREFACE

This is the third and final volume of a series of reports on urban transportation by the Seminar Research Bureau of Boston College.

The three reports are the result of a comprehensive two-year study of travel in the Boston Region, and present findings and recommendations based on that study.

With gratitude for the opportunity to undertake this study, Boston College thanks those who contributed the necessary resources: many of the business world of Metropolitan Boston, the Ford Foundation, the computer laboratories of the Massachusetts Institute of Technology and Harvard University, The Automotive Safety Foundation, and numerous specialists.

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MAP I

REGIONAL BOSTON

100 Cities and Towns

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

This series of studies by the Seminar Research Bureau of Boston College has reported the results of a complete origin and destination survey of Metropolitan Boston. In doing so, it has estimated the amount and direction of current and future travel in this Region, and assigned the resulting travel volumes to appropriate transportation facilities--either those that presently exist or are planned, or in certain cases, to entirely new facilities which this study feels are necessary.

The study has examined the trends of population, economic development and employment, and their implications for travel generation and transportation needs. In short, the study has sought both short and long range solutions to the transportation problems of this constantly growing metropolis.

In the last analysis, such an investigation can have but one application: that of evaluating current regional transportation and development programs. The conclusions and recommendations of this report deal specifically with such an evaluation. We believe that these recommendations, if followed, will result in a regional transportation system which will prove adequate for both present and future travel demands.

This study is not aimed at providing complete congestion-free travel. Such a goal would require too many additional expressway lanes into Downtown Boston and thousands of additional off-street parking spaces. Rather, the objective must be a transportation system of highways, parking, and mass transit that is capable of giving balanced access to the areas of existing and future development.

Boston and all other cities have long sought the "final" solution to growing traffic problems - perhaps with the hope that each new highway would achieve the final congestion-free goal.

A "final" solution does not exist. To meet our urban transportation problems we need organization, hard work, the appropriate use of specialists, and statesmanship. The final product of these efforts will be the eventual creation of many of those facilities - highway and transit - that have been the subject of debate for many years.

This is the general tone of the conclusions herein: that Metropolitan Boston need, for the most part, to implement what has heretofore been justified.

Metropolitan Boston has committed itself to a certain pattern of expressways and transit lines. Basically this pattern can, when put in more complete form, serve this region well.

The expressway-highway system is generally a network of radial routes converging upon Downtown Boston. These radials are joined at the Central Artery and also connected together by the Inner Belt and Route 128 circumferentials.

The mass transportation system, on the otherhand, is entirely a radial network focusing upon the high density center of Downtown Boston.

Downtown Boston is the center of the metropolitan area. Its economic stability and growth depend in part upon the transportation system; and the transportation system, likewise, depends in part upon the size and function of Downtown. It is con-

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Downtown Boston is the center of the metropolitan area. Its economic stability and growth depend in part upon the transportation system; and the transportation system, likewise, depends in part upon the size and function of Downtown. It is con-

cluded herein that:

1. Downtown Boston should establish a minimum but obtainable goal of preparing to handle 650,000 person-trips each day (an increase of 70,000 over the current number of 580,000 person-trips with destination Downtown).
2. These trips must be accommodated by both highways and mass transit--and in much the same proportions as exist today; 37% by mass transit, 63% by motor vehicle.
3. The additional motor vehicle users will create the need for at least 10,000 more Downtown off-street parking spaces.
4. The additional motor vehicle users will require additional street capacity both within the Downtown area and on the streets connecting the expressways and Downtown.
5. The amount of crosstown traffic passing through Downtown Boston is of such magnitude and potential as to consume the equivalent of practically all of the additional space of the new expressways now being planned.
6. The importance of rapid transit is outstanding in this analysis. Downtown Boston can contribute its share to the growth of this region only if there is an increase in the number of rapid transit riders into Downtown each day. Not only must the recent losses of rail commuters be compensated for, but additional riders must be provided for-at least to the levels of 1956 - 1957, when mass transportation

carried 30,000 more people into Downtown than it does today.

7. The inducement to be offered potential mass transit riders must initially be the creation of a moderate number of rapid transit extensions to the areas of heavy commuter suburbs, and the construction of terminal off-street parking areas.

The Circumferential Expressway System

The circumferential patterns of daily trips proved unexpectedly high. These trips, which have a tangential orientation rather than radial, have a magnitude which explains the heavy use of Route 128 and the need for the Inner Belt.

1. The Inner Belt proves to be the most necessary expressway in the entire network. It is concluded that the expressway system as constructed and proposed will not function with any degree of satisfaction until the Inner Belt is in operation, running through Cambridge and Roxbury with appropriate connections with the Central Artery, and with all radial expressways. From a traffic point of view, the Inner Belt when completed will be used to complete capacity. The analysis shows it is physically impossible to satisfy all of the expected crosstown trips. It is recommended that this highway receive the highest possible priority.
2. An Intermediate Belt. The great amount of crosstown traffic - both existing and particularly in the

future - requires that an additional circumferential limited access expressway be planned and constructed practically midway between the Inner Belt and Route 128. By 1980 this belt route will need an 8-lane capacity with which to help relieve the excessive flows on the Inner Belt and the Central Artery. The primary utility of a route of this nature will be to divert crosstown traffic from the growing suburbs away from all of the inner expressways (including the radials) which will become overly congested shortly after completion. It is recommended that this route receive immediate planning and design.

3. Route 128 should become somewhat relieved as a result of the Inner Belt and Intermediate Belt. But due to industrial development along its edges, and because of the growing amounts of interstate and vacation travel on it, it can be expected to be fully used. As a result, the widening of Route 128 appears fully justified.

The Radial Transportation System

The radial transportation system of Metropolitan Boston has received the greatest amount of attention during the past 15 years. As a result it is more fully developed than circumferential facilities. However, the growth of travel generally and the specific increases in travel to and through the inner parts of the region have caused a continual need for more facilities. Those facilities that must be constructed in the immediate years ahead to create a complete system for this region are

listed below.

I. The Northeast Sector

Because of the construction of the Northeast Expressway, the Mystic River Bridge, the new tunnel and the East Boston rapid transit line, the Northeast Sector will have fewer transportation problems to cope with.

Recommendations are:

1. Completion of the Northeast Expressway as part of Interstate Route 95. The only section of this Interstate Route lacking between Downtown Boston and Augusta, Maine, is that section from the Northeast Expressway in Revere to Route 95 in Danvers.
2. Extension of the East Boston - Revere Rapid Transit Line to the Revere Airport area and construction of large off-street terminal parking areas.
3. Integration of design plans in the Revere Airport area of the Northeast Expressway connection, the Intermediate Belt, the rapid transit extension and the off-street parking areas.
4. The continued maintenance and improvement of major streets and highways in this sector to insure adequate service for short and moderate length travel.

II. Northern Sector

Although the Northern Sector will soon benefit by the opening of parts of the Northern Expressway, this Interstate Route 93 between Boston and Lawrence, when completely connected with the entire highway network will become overcrowded, particularly on its inner sections. In addition, the problems of

capacity caused by the design of the Central Artery and its connection with the Inner Belt, the Northern Expressway, the Mystic River Bridge and Northeast Expressway, seriously restrict traffic flows from the Northern Sector. In fact, the converging of many major expressways in one area and eventually one highway (the Central Artery) creates the single greatest bottleneck area of the entire transportation network. Solutions to this problem aimed at providing adequate service to the Northern Sector can only be attained through the use of both highway and transit improvements.

Recommendations are:

1. Coordinated planning for all transportation facilities in the Downtown-Charlestown-Cambridge-Somerville area (The North Terminal Area.)
2. Immediate formulation of design of the Inner Belt and its connections to the Central Artery, Mystic River Bridge and Northern Expressway.
3. Preparation of feasibility and design studies leading to construction of a high-capacity rapid transit extension of the Everett rapid transit line from Charlestown to parking areas near Route 128 in Wakefield or Reading.
4. Improvement of major streets and highways serving traffic between the Northern Sector and Downtown Boston.

III. Northwest Sector

The Northwest Sector will eventually be well served by the construction of two limited access expressways - Routes 2

and 3. However, neither of these routes will extend inward beyond the Inner Belt. It will be necessary, therefore, to improve the accessibility between the Inner Belt and Downtown Boston.

The recommendations are:

1. High priority construction of the Inner Belt to relieve major streets and highways of crosstown traffic.
2. Early construction of the Route 2 expressway from the Inner Belt in Cambridge to the Intermediate Belt in the Arlington-Cambridge area.
3. Eventual construction of both Route 2 and Route 3.
4. Immediate preparation of cost-benefit and feasibility studies to determine the location of a rapid transit extension to parking areas in the general location of the Intermediate Belt at or near the Arlington-Cambridge boundary. This study should determine whether the Lechmere PCC line or the Harvard Rapid Transit line can best be extended at reasonable cost.
5. Coordination of planning and design of the highway and transit improvements in the Cambridge-Arlington area where these facilities become geographically and functionally merged.
6. Improvement of major street access between the Inner Belt and Downtown Boston including the upgrading of existing Route 2, the Northern Artery and Memorial Drive.

IV Western Sector

Transportation improvements in the Western Sector have been delayed for many years. Plans to extend the Massachusetts Turnpike from its present terminus in Weston into Downtown Boston were recently deferred because of the Authority's inability to market the necessary bond issue. Alternative plans for construction of the extension as a freeway from Route 128 to the Inner Belt have been proposed since 1948. This analysis indicates that this extension, when built, will be heavily used on those sections between the Inner Belt and Route 128, but that an extension beyond the Inner Belt into Downtown Boston would be lightly used.

The recommendations are:

1. Construction of a limited access expressway from Route 128 to the Inner Belt receive the highest priority.
2. The design of this extension should include full interchange with the Inner Belt and the opportunity for interchange with an Intermediate Belt.
3. Preservation of a two-track right-of-way along the route of the expressway for future mass transit facilities between Downtown Boston and the western suburbs.
4. Retention of interim mass transit service until such time as the effect of the expressway can be better evaluated.

5. Preservation and maintenance of all major streets providing access between the West and Downtown, and consideration of an additional major feeder street into Downtown from the Inner Belt area.

V. Southwest Sector

The planned Southwest Expressway between the Inner Belt and extending through this sector to Providence is the continuation of Interstate Route 95 connecting New York and Connecticut with Boston and Maine. This expressway is badly needed in an area where few major facilities exist. It can be expected to be used up to capacity after it is completely connected to the other parts of the network. This facility will also help in alleviating the serious traffic problems of the Southeast Sector. However, the Southwest Expressway will not in itself provide a complete solution to the travel problems in this area.

The recommendations are:

1. Assignment of a very high priority to the construction of the Southwest Expressway.
2. Formulation of plans and designs of this route that are consistent with: land development programs in Roxbury; the need for diverting some traffic away from the Southeast Expressway; and, plans for mass transportation improvements.
3. Increase the capacity of those major streets which connect with the Southwest Expressway just south of the point where the Expressway joins the Inner Belt and Downtown Boston.

4. Preparation of plans and designs for extension of the Forest Hills Rapid Transit Line through Roslindale and West Roxbury to parking areas adjacent to Route 128 in Needham or Dedham.

VI. Southeast Sector

The Southeast Sector faces the greatest transportation problems of the entire Metropolitan area. Partly, because this sector is so big, and partly because it is growing rapidly, these problems threaten to become even greater. The daily congestion on the Southeast Expressway during peak hours is but an example of what to expect in the future. Even with construction of the Inner Belt, the Intermediate Belt and substantial diversion of motorists to the Southwest Expressway, this sector will not have adequate transportation facilities until a very high-capacity rapid transit line is in operation. Even with a good rapid transit line and all the proposed expressways, this sector will require constant surveillance to insure that a ~~minimum~~ MAXIMUM of accessibility to Downtown is maintained.

The recommendations are:

1. Immediate installation of a high-speed, high-capacity rapid transit line between Downtown Boston and large terminal parking areas in the Braintree-Weymouth Area.
2. Preparation of plans and designs for the Intermediate Belt to connect with the Southeast Expressway near the Neponset River. (Requiring integration of transit, parking and highway designs).

3. Preparation of plans and designs of major street connections between the Southeast Expressway and Downtown Boston at a point south of the interchange between the Southeast Expressway and the Inner Belt. These streets in the South Bay area should be designed to allow additional capacity into Downtown Boston from the Southeast Sector.

4. Improvement of existing major streets in the Dorchester area (Morrissey Boulevard and its connections to Downtown; Dorchester Avenue and Blue Hill Avenue.)

INTRODUCTION

A transportation study must have a philosophic foundation to guide it. It can be pessimistic or optimistic, conservative of liberal. It can be oriented towards automobiles or rapid transit, the suburbs or the central city. It may be metropolitan or provincial in nature. It can be many things that will please or displease those who have already made up their minds.

This study is metropolitan in nature. It is conservative and optimistic, is oriented toward both the suburbs and the central city, and is concerned with both automobiles and rapid transit. And - most important - it is realistically based on facts about growth and travel in the Boston Region.

The underlying philosophy adopts a metropolitan framework because urban transportation is a metropolitan skeleton. Automobiles and suburbia are embraced because people like them and neither works without the other. The Central City and rapid transit are adopted because people need them and neither works without the other.

This study is optimistic about Metropolitan Boston because this is the era of cities and great metropolitan areas that cannot long be held back by provincial or pessimistic attitudes.

And this study is conservative in that it recommends action on those transportation facilities required in the

immediate future. In every instance of a specific recommendation, the facility is either required at the present time or will be by the time it can be constructed.

There is only one real reason for momentarily entertaining a less positive attitude. The experience of planning and building a well balanced urban transportation network for metropolitan Boston during the past ten years has been one of frustration. Many of the soundly conceived transport facilities and improvements have been delayed for various reasons. Outstanding among them are uncertainties about the future of the central city and about the future of mass transit. As influential as any reason is the mere fact that metropolitan Boston has not yet equipped itself with an agency responsible for planning and thinking of all transportation and land development potentials and problems in a manner that provides comprehensive solutions that are in the interests of all.

Metropolitan Boston and large cities throughout the world are in the midst of coping with the great challenge of urban transportation. In the recent past this area has made accomplishments through the construction of a number of expressways and two rapid transit line extensions. It has many years of continued construction to finish even a first phase of facilities recommended in 1948. And in the process it must look ahead to a second phase of construction.

The purpose of this report is to describe the results and

implications of the existing and future patterns of population, employment and daily travel upon the regional transportation network of Boston.

The origins and destinations of all but short trips have been assigned to a regional expressway and transit network. These assignments have been compared with the capacities of existing and proposed facilities. A number of alternatives have been fully considered.

In considering our findings and recommendations on circumferential and radial travel and facilities, the reader should keep the following premises in mind:

1. Local traffic (defined herein as trips made within a traffic area and trips between adjacent traffic areas) is not included in the traffic volumes described. Trips made from traffic areas B, E, H, K,O and S [1/] to Downtown Boston are not included since they are trips between adjacent areas. All local trips of this type have been assigned to the local street and mass transit system rather than to expressways.

2. The volumes of traffic or person-movements shown herein do not include those persons using mass transit. The values deducted from the traffic volumes approximate the existing number of longer transit riders from each traffic area to downtown Boston on all forms of mass transportation vehicles: rapid transit, PCC cars, buses and commuter railroads. In the analysis below the

---

1/ See Map II on page 5.

existing (1959) numbers of transit riders have also been deducted from 1980 traffic volumes.

3. The volumes indicated represent the annual average daily traffic of all motor vehicles in both directions. The 24 hour volume in one direction would be one-half of the values shown.

4. The indicated capacities of highways and expresaways are shown as a range: the lower value represents the design capacity of 15,000 motor vehicles per day per lane of limited access expressway; the higher capacity value shown below represents the possible or maximum capacity of 20,000 vehicles per day per lane of limited access expressway. This higher capacity has been reached on numerous facilities throughout the country where there is an unusually high proportion of non-peak hour travel, exceptional design and control, and an acceptance of much more congestion and delay. Higher capacity cannot be justified.

It was the intent of this analysis to maintain the assignment of traffic volumes to the expressway network at design capacity levels. However, the heavy growth prospects of travel in this region disallow a close conformance to this principle and in most cases the volumes assigned will approximate the maximum capacity.

5. Car occupancy incorporated herein is 1.45 persons per vehicle in 1959 and 1.33 persons per vehicle in 1980 except for those vehicles making trips to and from downtown Boston where the parking restriction and general traffic congestion as well as the need for maximizing some car pool operation deem it necessary to maintain a ratio of 1.45 persons per car.

MAP II

REGIONAL BOSTON, TRAFFIC ZONES AND TRAFFIC AREAS

DOWNTOWN BOSTON

MAP III

DOWNTOWN BOSTON

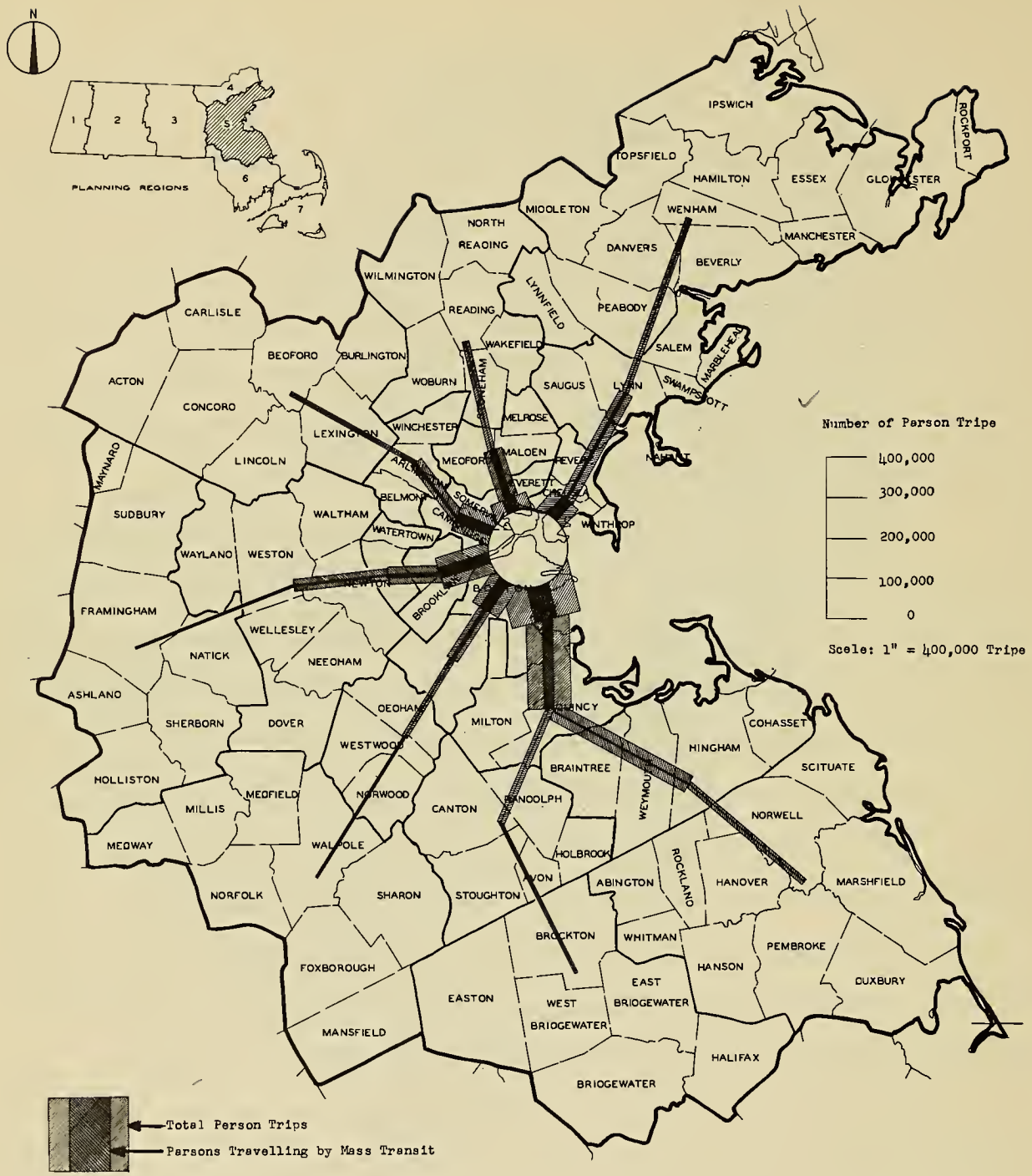
DOWNTOWN BOSTON

Downtown Boston is the Region's largest center of employment and business, culture and entertainment. As such, it is the Region's greatest trip generator. The downtown area is the center of greatest traffic congestion, the primary concern of governmental officials, the recipient of the greatest amount of transportation dollars, and the focal point of all mass transportation and railroad commuter difficulties.

During the past decade people have watched the growth of commerce in the suburbs and have wondered about the future of the central city. They have watched the new highways and wondered about the future of mass transportation. Hesitant attitudes about downtown seemed justified for a time but the economics of the situation indicate that downtown areas must grow along with suburbia.

This study firmly believes that growth in downtown is an inherent part of, and must take place simultaneously with, metropolitan growth. All that is required is the opportunity, part of which is improved accessibility - such as is provided newly developed lands in the suburbs adjacent to new expressways.

But it is of little value to improved accessibility for the downtown area if new expressways are built only to be accompanied by curtailed or abandoned railroad service or slowly decreasing transit patronage. Nor is it of particular value if additional expressway capacity is accompanied by downtown parking spaces that are consumed by the all day parker at the expense of two, three or four short-term shopping or business trips.



MAP IV

1959 TRAVEL TO DOWNTOWN BOSTON *

* Total Daily Person Trips and Mass Transit Trips

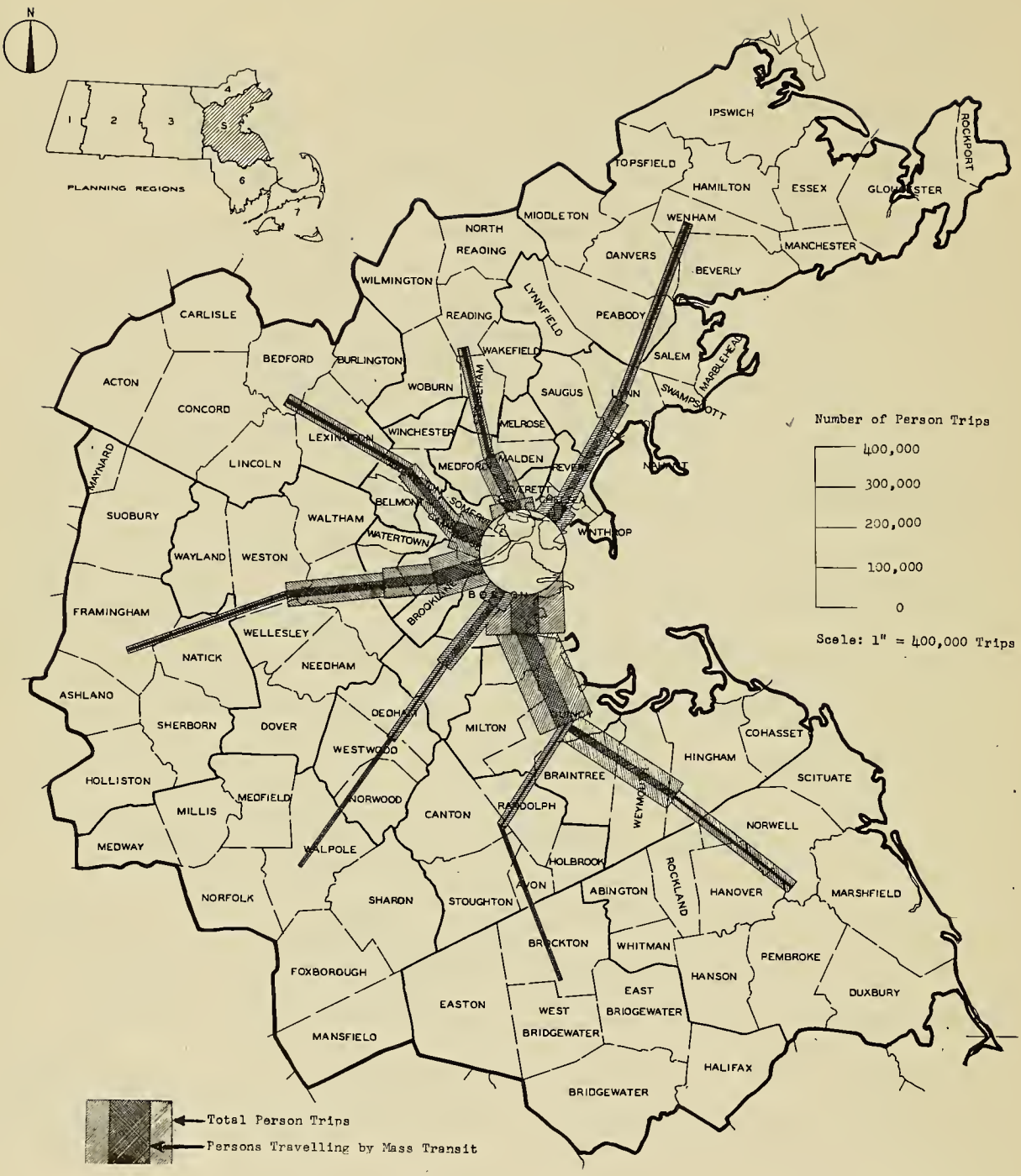
Amount of Travel to Downtown Boston

Maps IV and V show the amount of daily travel to Downtown Boston in 1959 and 1980. At the present time some 580,000 person-trips are made daily to Downtown Boston. An equal number are made from Downtown Boston each day to all parts of the Metropolitan area. As shown below, slightly more than 37% of the total trips to Downtown are for the purpose of going to work.

It is hereby set forth as a minimum but obtainable 15-20 year objective that Downtown Boston prepare to accommodate at least 650,000 daily person-trips. This objective has been determined as a result of observation and adjustment of the calculated trips to Downtown in such a manner as to provide the opportunity for a modest improvement of Downtown travel. This increase in travel will account for an 11.5% increase in total travel to and from Downtown.

Travel to Downtown Boston, 1959 and 1980

	1959		1980	
	Number	%	Number	%
Work Trips	215,000	37	245,000	37
Non-Work Trips	365,000	63	405,000	63
Total Trips to Downtown	580,000	100	650,000	100



MAP V

1980 TRAVEL TO DOWNTOWN BOSTON *

* Total Daily Person Trips and Mass Transit Trips

Origins of Travel to Downtown

The actual layout of required transportation facilities leading to the Downtown area depends in large part upon where these trips begin; i.e., the home of the Downtown worker, shopper or visitor. Table 1 presents the number of daily person-trips from each of the traffic areas to Downtown Boston (an equal number make the return trip each day).

Of particular note is the expected change in the number of person-trips to Downtown from the inner residential traffic areas of B, E, H, K, O and S (see Map II, p. 5) between the present time and 1980.

In 1959 the number of trips to Downtown from these areas total 280,000 each day or 48% of all Downtown-bound trips. In 1980 the number of trips from the same areas total 220,000 or only 34% of the total trips to Downtown. This decrease is expected because of continued migration of residents from the inner communities to the intermediate and outer suburbs. The implication of this population shift is simply more longer trips to Downtown. These numbers demonstrate the general validity of often repeated remarks about the need to extend the MTA out to the areas of population growth.

Table # 1

Seminar Research Bureau
Boston College

Number of Daily Person Trips By Area of Origin - To Downtown Boston

Originating Traffic Area	1959	1980	Percentage Change 1959 to 1980
B	45,800	39,000	- 14.8 %
C	19,400	20,300	+ 4.6
D	17,400	26,000	+ 49.4
E	43,100	32,500	- 25.6
F	32,800	41,000	+ 25.0
G	19,300	32,500	+ 68.4
H	41,300	43,000	+ 4.1
I	20,200	24,000	+ 18.8
J	12,500	29,000	+ 132.0
K	37,600	24,600	- 34.6
L	11,300	16,200	+ 43.4
M	20,900	42,000	+ 100.9
N	10,000	19,500	+ 95.0
O	45,400	28,500	- 37.2
P	13,600	16,200	+ 19.1
Q	6,700	11,600	+ 73.1
R	8,800	13,000	+ 47.7
S	66,800	52,000	- 22.2
T	41,800	37,500	- 10.3
U	11,000	14,300	+ 30.0
V	10,600	12,200	+ 15.1
W	24,800	39,000	+ 57.3
X	18,400	36,000	+ 95.7
TOTAL	580,000	650,000	+ 12.1

Mode of Travel to Downtown

The mode of travel to be utilized by travellers between the residential communities and Downtown is a sore subject in Metropolitan Boston - particularly when a transit extension is proposed into a suburban community not part of the existing Metropolitan Transit Authority District. This issue in practicality will prove as influential upon the future of economic growth in the Downtown area and elsewhere in Metropolitan Boston as programs and policies affecting highways.

A considerable number of individuals have the choice of automobile or transit. For the greater proportion the choice is automobile. For many the choice must be automobile because of the lack of reasonable mass transit service. At the present time some 60-65% of those bound for Downtown use private motor vehicles. This proportion is being forced to grow due to curtailments of railroad commuter service and by the inducements of bigger and better highways.

But there is a limit to the number of cars that can enter Downtown and find a place to park. This limitation is imposed specifically by the number of lanes of street and expressway facilities and the number of parking spaces. More generally, this limitation is one of space within the Downtown area that must zealously be allocated to commercial development as well as highways and garages.

In view of general space requirements in the Downtown, and the findings drawn in the following pages, it is concluded that

Downtown Boston must continue heavy reliance upon mass transit. It is expected that mass transit must continue to serve over 35% of those daily travellers with destinations Downtown. Because the total number of persons travelling to Downtown is expected to increase, the amount to be carried by mass transit must also increase.

The volumes to be planned for are as follows:

MODE OF TRAVEL TO DOWNTOWN BOSTON

	1959	1980
Persons in motor vehicles	370,000	410,000
Persons using mass transit	210,000	240,000
Total daily trips	580,000	650,000

The expected increase in mass transit riders is 30,000 (one direction) or 15%, to a 1980 total of 240,000. This amount is substantially less than the number of mass transit users on MTA, rail and bus facilities in 1950.

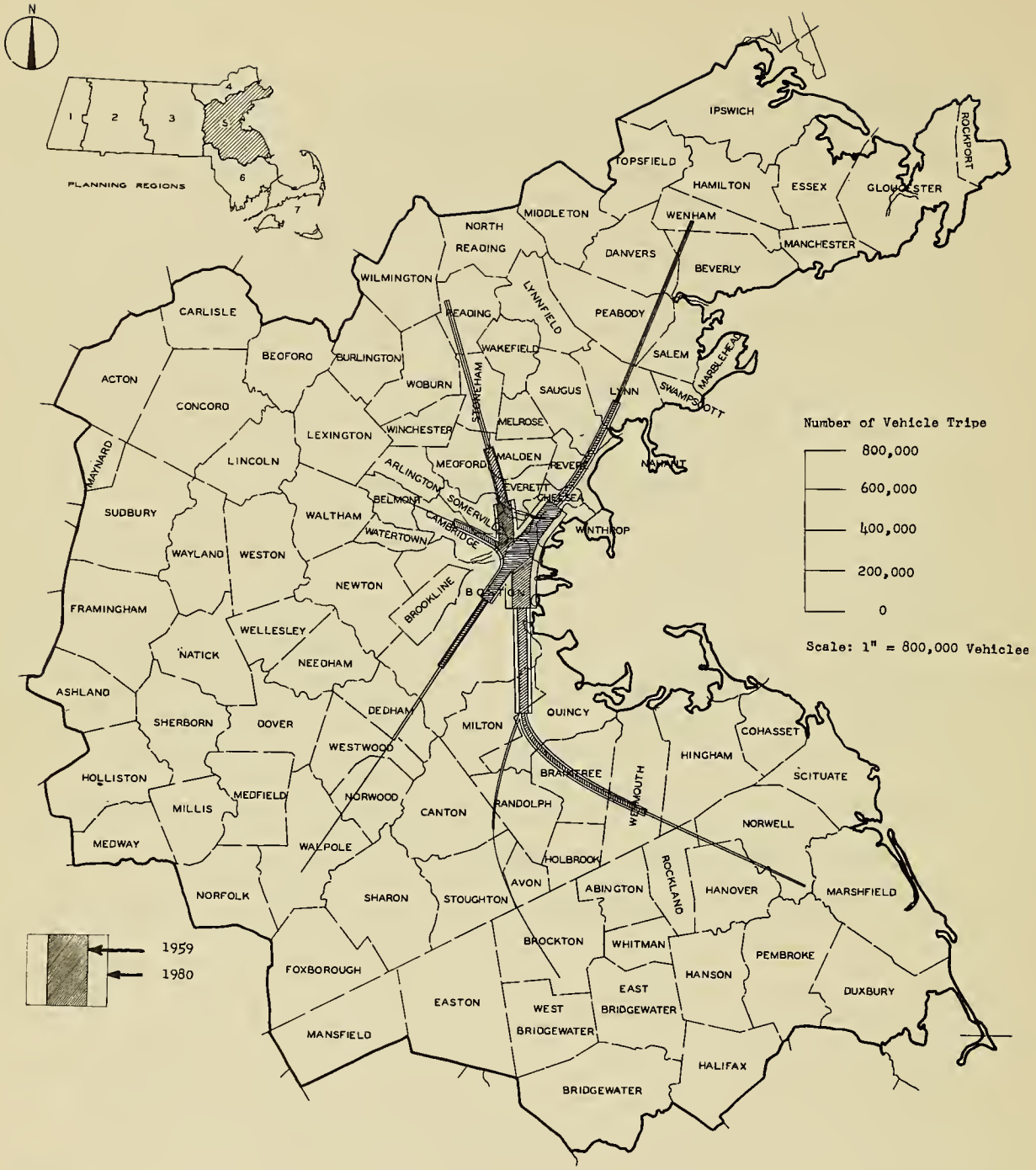
The expected increase in motor vehicle users is 40,000 person-trips (one direction) or 11% to a 1980 total of 410,000. This amount is substantially higher than in 1950.

Capacity of Entering Streets & Highways

The actual capacity of streets and highways entering the Downtown area is one major restriction to the number of vehicles that can squeeze into the Downtown area daily or during peak hours of traffic movement. This capacity has constantly and substantially increased during the past decade or two. In 1938 street approaches into the Downtown area allowed some 220,000 motor vehicles to enter the Downtown area each day. By 1954 this capacity had grown to over 260,000 (with the principal increase provided by the construction of Storrow Drive). The addition of six entering lanes on the Central Artery further increased this capacity to about 380,000 motor vehicles per day, and the addition of the new tunnel and expressway[1/] from the West will increase the total daily motor vehicle entering capacity to about 460,000.

When these latter two projects are completed, the total capacity will be more than twice that available in 1938.

1/ Or of major streets with capacity equivalent to that of an expressway.



MAP VI

CROSSTOWN TRAFFIC FLOW, 1959 & 1980 *

* Two Directional Motor Vehicle Trips Travelling Across Downtown Boston

Crosstown Traffic

Along with the substantial increase in highway capacity and motor vehicle accessibility there has been a constant increase in traffic through the Downtown area. These motor vehicles have origins on one side of Downtown Boston and destinations on the other side. (See Map VI).

It is normal and expected that as travel increases generally, this type of travel will also increase. With the current unfinished highway system, which induces through traffic onto the Central Artery, the proportion of through traffic is now unnecessarily high at the expense of Downtown accessibility and economy.

This analysis finds that a minimum of 110,000 motor vehicles per day would still enter and leave the Downtown area without stoping if the Inner Belt were in existence as an alternative route for many trips. Therefore, almost 30% of the capacity of existing streets and highways entering Downtown Boston would normally be consumed by through traffic.

Actually this figure is much higher because the Inner Belt does not exist. It is conservatively estimated that at least 35% of the traffic now entering Downtown is through traffic.

The number of through trips projected for 1980 is much greater. It is estimated that about 185,000 motor vehicles will attempt to pass through the Downtown area each day. This will represent a percentage of 40% of the total entering capacity of 460,000 motor vehicles per day. This proportion can become even

higher if the eventual highway network is such as to encourage travel through Downtown. Conversely, it will be lower if the network design induces travel around Downtown on a well designed circumferential expressway system.

Because of the projected increases in "through" traffic, the increased capacities of future streets and highways is not wholly available to motorists bound for Downtown. In fact, analysis of the figures presented above indicates that, despite the capacity increases, there will be little space left for increased numbers of Downtown-bound vehicles.

In recognition of this situation this study has recommended a certain series of improvements that will allow additional motor vehicle capacity into the Downtown area. These improvements in the form of major street design should provide for at least 25,000 motor vehicles per day. This additional capacity would accommodate the additional 40,000 motor vehicle users described above.

OFF-STREET PARKING

The off-street parking problem in Downtown Boston is the greatest deterrent to travel to the Central Business District. While progress has been made during the past few years, and the number of spaces has increased by some 10,000, more will be needed to accomodate vehicles expecting to use new streets and highways.

This study estimates an immediate need for new spaces for some 25,000 vehicles. Assuming an average turnover of 2.5 cars per space per day, this means an additional 10,000 off-street parking spaces are required in the Central Business District.

To this number must be added the spaces required to replace on-street spaces that currently cause undue and costly congestion on the Downtown streets. Altogether, therefore, the total requirement is of the order of 12,000 to 15,000 additional spaces.

The actual number of parking spaces required, and the dollars to be invested, is a distinct function of how these spaces are to be used; by the all day parker or by two, three or four mid-day users. The patterns and volumes of travel throughout the Metropolitan Area indicate that a great number of potential trips to Downtown do not take place because of the parking deficit.

A much better economic climate will exist in Downtown Boston, and a substantially greater use of expressways and highways will occur when Downtown parking fee policies discourage all-day parking and leave more space for the short term user.

MAP VII

REGIONAL BOSTON, EXISTING MASS TRANSPORTATION

Mass Transportation

This analysis has treated mass transportation as necessary to serve travelers between the suburbs and Downtown. The patterns of origins and destinations demonstrate that mass transportation must fulfill a service role that accompanies the rate of growth or decline of the Downtown area itself. In other words, a decline in the importance of Downtown will be accompanied by a continued decline in the use of mass transportation. However, the projected increase in the status and economy of Downtown must be paralleled by an increase in mass transit use.

While this study states quantitatively the effects of growth on the travel requirements in this area, the resultant effect on mass transportation is not as easily identified. This results from the fact that there are numerous factors which influence the use or non-use of mass transit facilities. These factors include such things as administrative and managerial policies, and design and capacity of proposed transit facilities - all of which are not amenable to quantification.

Notwithstanding these difficulties, however, estimates of future transit needs are necessary to comprehensive transportation planning. Therefore, the estimates presented in Table 2 are based on the following premises:

1. The future use of mass transit facilities is primarily dependent upon the provision of rapid and relatively inexpensive service.

2. While mass transportation as an industry will not pay its own way, it benefits the areas it serves by relieving highway congestion and by its salutary effect on real estate values.[1/]

The number of mass transit riders in all forms of facilities now number some 210,000 person-trips per day to Downtown Boston. This compares with estimates of as high as 300,000 mass transportation trips in 1950; and 240,000 mass transportation trips in 1956.

The decrease has consisted of persons transferring to motor vehicles, and those making trips elsewhere than Downtown. The more recent curtailments of railroad commuter service have caused these numbers to dip further.

The estimates contained herein demonstrate the need for mass transportation to increase its service to Downtown to an average of 240,000 person-trips daily. This is a relatively small increase in view of the past capabilities of mass tranait facilities.

An increase of this magnitude should not cause a need for major construction in the Downtown area in order to increase the capacities of Downtown tunnels. However, it is recognized that certain rapid transit bottlenecks do exist that may require improvement (for example, the Park Street-Scolley Square area). Furthermore, the long-term realignment of passenger flows into Downtown

1/ This statement, however, should not be construed as suggesting that mass transit deficits should not be subject to control.

Boston may in time create new bottlenecks. When these occur, improvements may be necessary.

The doubtful justification of Downtown transit improvements does not carry over into the need for transit extensions. The need for transit extensions is best described by careful analysis of the numbers on the preceeding page. These are estimated volumes of existing and projected transit riders from the traffic areas of the Boston Region to Downtown.

As in the case of total trips to Downtown Boston, the origins of mass transit riders will continue to decrease in the inner residential areas and increase in the intermediate and outer suburbs.

In 1959 the number of mass transit riders to Downtown Boston from the inner traffic areas of B, E, H, K, O, and S total 128,000 persons-trips or 61% of all mass transportation users. Only 21.5% originate in the intermediate traffic areas; 17.5% originate in the outer traffic areas.

In 1980 the proportions change. It is expected that only about 100,000 (or 41.5%) will originate in the inner ring of traffic areas; 60,000 or 25% will originate in the intermediate ring of traffic areas; and some 80,000 (or 33%) will originate in the outer traffic areas.

Table # 2

Seminar Research Bureau
Boston College

Estimated Mass Transit Trips to Downtown Boston, 1959 & 1980

Originating Traffic Area (See Map # II)	1959	1980	Percentage Change 1959 to 1980
B	20,000	17,000	- 15.0 %
C	6,000	8,000	+ 33.3
D	4,000	8,000	+ 100.0
E	20,000	14,500	- 27.5
F	11,000	16,000	+ 45.5
G	4,000	10,000	+ 150.0
H	20,000	19,500	- 2.5
I	8,000	9,000	+ 12.5
J	2,000	9,000	+ 350.0
K	18,000	11,000	- 38.9
L	4,000	6,500	+ 62.5
M	6,000	14,000	+ 133.3
N	2,000	5,000	+ 150.0
O	20,000	12,500	- 37.5
P	5,000	6,500	+ 30.0
Q	2,000	4,000	+ 100.0
R	2,000	3,500	+ 75.0
S	30,000	23,000	- 23.3
T	15,000	14,000	- 6.7
U	2,000	5,000	+ 150.0
V	2,000	3,000	+ 50.0
W	3,500	13,000	+ 271.4
X	2,500	9,000	+ 260.0
TOTAL	209,000	241,000	+ 15.3

1. As a minimum but obtainable 20-year objective, it is recommended that Downtown Boston prepare to accommodate some 650,000 daily person-trips by 1980. These will consist of an average of 245,000 daily work trips and some 405,000 daily non-work trips. Thus, work trips will account for about 37% of all trips into Downtown Boston in 1980.
2. The number of trips to Downtown made in motor vehicles will increase from 370,000 to 410,000 by 1980. This means that the number of motor vehicles destined for Downtown each day will increase from 255,000 to more than 280,000, an increase of about 10%.
3. It is recommended that 240,000 of the total daily trips to Downtown be accommodated by mass transportation. This represents an increase of 30,000 daily person-trips (15%) over the present number of 210,000. (This value, however, is not greater than the number of mass transportation riders to Downtown in 1950, before the more recent curtailments of railroad commuting service.)
4. In view of the transportation implications of land development set forth in this study - especially with regard to Downtown - it is recommended that land development policies within the Downtown area recognize that:
   a. for each additional three jobs created Downtown, there will be three additional work trips and at

least five additional non-work trips;

b. for each additional apartment demolished and not replaced, there will be at least one additional trip each day;

c. for each additional dwelling unit created Downtown there will be one less work trip each day, and one less parking space required.

5. To accommodate the increased volume of motor vehicles, it is recommended that Downtown plan and program for early construction a minimum of 10,000 off-street parking spaces, the great majority of which should be designed and reserved for non-work trip purposes. The location of these spaces and the parking fee rate must be such as to encourage the off-peak, shorter-term parker, who has a choice of bringing his business to Downtown or elsewhere. (The number of required spaces indicated above does not include those that must be constructed to replace congestion-causing on-street spaces in Downtown.)

6. To accommodate the greatly increased volumes of vehicles expected Downtown in years to come, it is recommended that more concerted effort be devoted to the modernization, use and layout of the Downtown street system. For, if the trip from home to expressway to Downtown local street to parking isn't reasonably free of congestion, much of this traffic will be discouraged away from Downtown.

REGIONAL CIRCUMFERENTIAL SYSTEM

MAP VIII

REGIONAL BOSTON EXPRESSWAY SYSTEM

CIRCUMFERENTIAL TRAVEL AND REQUIREMENTS

Circumferential and crosstown travel in Metropolitan Boston is a greater cause of traffic congestion than is generally realized. The construction and use of Route 128 has demonstrated this travel characteristic in the outer suburbs of the region. Now many trips across or around the Metropolitan Region go out of their way to use this facility which offers freely flowing, "no-traffic-light-stop" moving. Travel on this facility generally is pleasing and more desirable for the longer trip than is the formerly used local street system.

With the expressway system as it exists today - the Northeast and Southeast Expressways connecting to the Central Artery, and with the existence of Storrow Drive and the new Northern Artery - many crosstown trips and circumferential trips are attracted inwards through the center of the city. This pattern mixes the crosstown travel unnecessarily with radially oriented travel and Downtown Boston travel. This combined travel exceeds the capacities of available facilities, and contributes to congestion in the inner areas of the region.

Just as important is the fact that the heavy volumes of crosstown traffic - short trips as well as long trips - that use the local street and highway system, are forced to cross the many avenues of radial flow. Thus, the capacity of each radial street carrying traffic to the inner parts of the region is materially reduced because traffic signals must be adjusted to allow both

radial and circumferential flows.

The effective capacity of radial routes can be substantially increased by eliminating some of the crosstown travel from surface routes that meet and cross radial routes.

The pattern of origins and destinations throughout the Metropolitan Area, and the magnitudes of these volumes are such as to justify the recommendations listed below.

THE INNER BELT

No other part of the entire expressway network assumes an importance as great as the Inner Belt. Although it is an integral part of the expressway system originally proposed in 1948 by the Master Highway Plan for Metropolitan Boston, this highway has not yet progressed much beyond the discussion and general planning stage. Because of the location through densely populated and developed areas of Cambridge and Boston, the displacement and cost problems have caused many delays. Uncertainties about the existence and design of other nearby highways have contributed to lack of attention to the Inner Belt. These delays have impeded the solution of Metropolitan Boston transportation problems, which in this particular regard grow worse while nothing is done.

Every substantial traffic and transportation report published since 1945 has emphasized the importance of the Inner Belt. The Master Highway Plan of 1948 for the Boston Metropolitan Area first recommended construction of the Inner Belt and Report on Traffic Studies for the Boston Metropolitan Area of July 22, 1957 restated the necessity by saying "The above densities show the need for an expressway in the location as assumed for this study. However, when the loading of this project is considered along with those of the Central Artery and the inner portions of the Radial expressways, it is evident that an additional inner expressway located within this proposed belt will be needed even if traffic increases at rates much lower than those used in this study in arriving at the 1975 traffic volumes."

In effect that report emphasized the need for the Inner Belt by suggesting that two such facilities would be necessary. And in reviewing this statement it is to be recalled that that analysis assumed that the Massachusetts Turnpike was in operation and carrying certain volumes (amounts not reported).

The results of this study verify all previous results of this nature. The Inner Belt as a collecting and distributing connector of the entire expressway network now under construction is the most important single section of the entire transportation network of Metropolitan Boston. Until it is constructed and in operation the rest of the system will operate much less efficiently and will be unable to carry necessary volumes of vehicles. Of particular emphasis is the often stated fact that the Central Artery will not be capable (and is not now) of accomplishing what is expected of it.

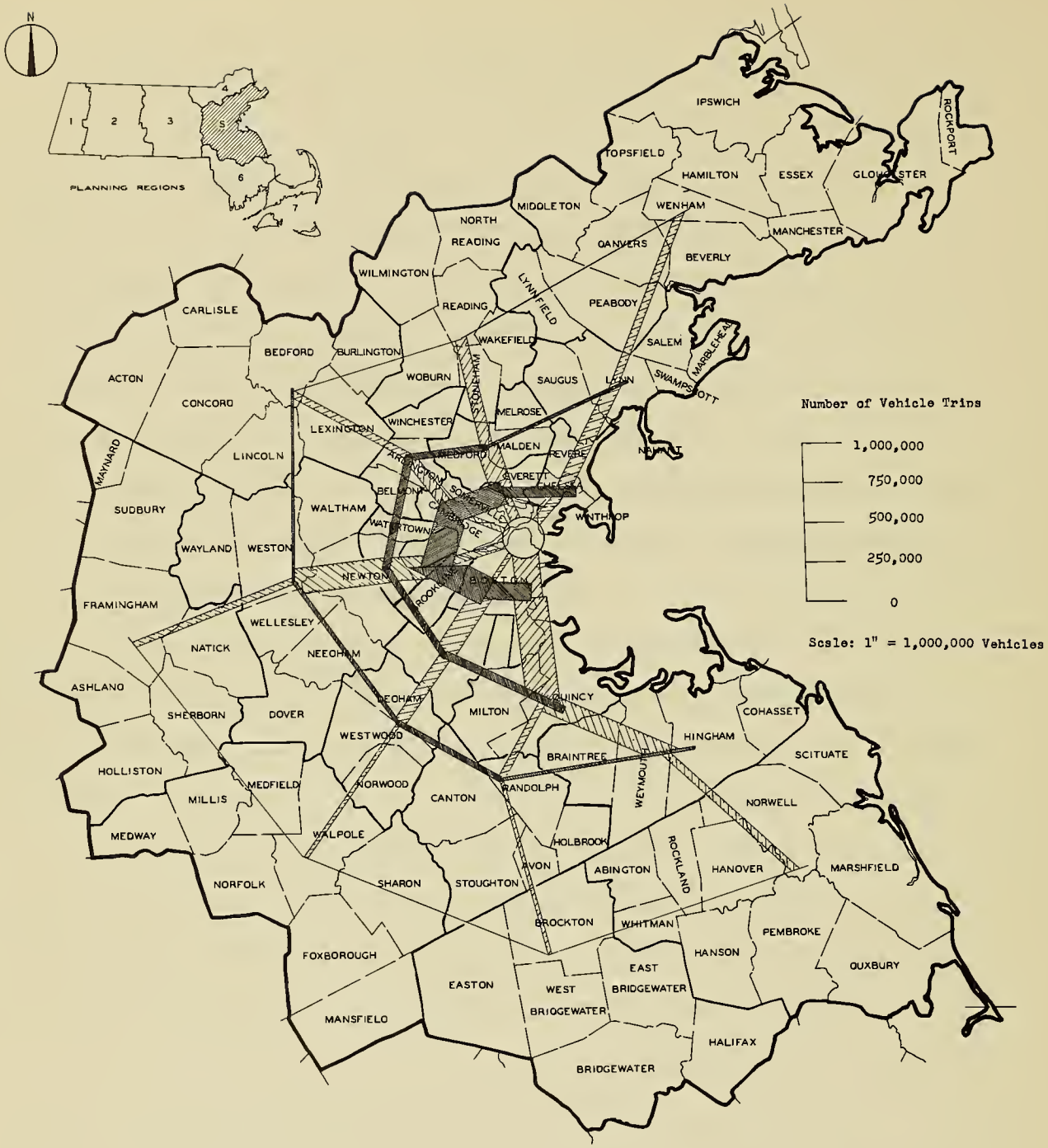
The volumes assigned to the Inner Belt demonstrate fully its very high priority. The assignment legs BE, EH, HK, KO and OS (see Map XX) are the equivalent of the Inner Belt and are located approximately where the Inner Belt has often been planned. There are no adequate existing streets and highways to aid the Inner Belt in carrying the volumes assigned. Massachusetts Avenue, the Boston University Bridge and other crossings of the Charles River, as well as connecting streets now serving crosstown movements are increasingly needed for local traffic. For example, traffic between Cambridge and the Fens area and Brighton have not been assigned to

the Inner Belt but have been assigned to the local streets, bridges, and highways.

The 1959 assigned volumes (shown on Map IX) are greater than the design capacity of an eight lane facility (four lanes in each direction). The design capacity at 15,000 vehicles per day per hour would provide a total capacity of 120,000 vehicles per day. The volumes shown for the assignment sections are 71,000, 150,000, 190,000, 180,000 and 110,000 vehicles per day (counterclockwise) in 1959. Thus, the middle sections of the Inner Belt would be overcrowded if the facility existed today.

In reviewing the traffic volumes on the Inner Belt it is to be noted that the inner radial sections BA, HA and OA from the Inner Belt to the center of Downtown are not parts of the proposed highway system. Therefore the traffic volumes shown assigned to these inner radial sections must use other facilities in the trip to and from Downtown Boston. The alternatives are to use major streets or the Inner Belt. If the choice is the Inner Belt, the shown volumes can easily be exceeded. In addition many local trips too short to be assigned to an expressway may attempt to use the "easier" flowing expressway.

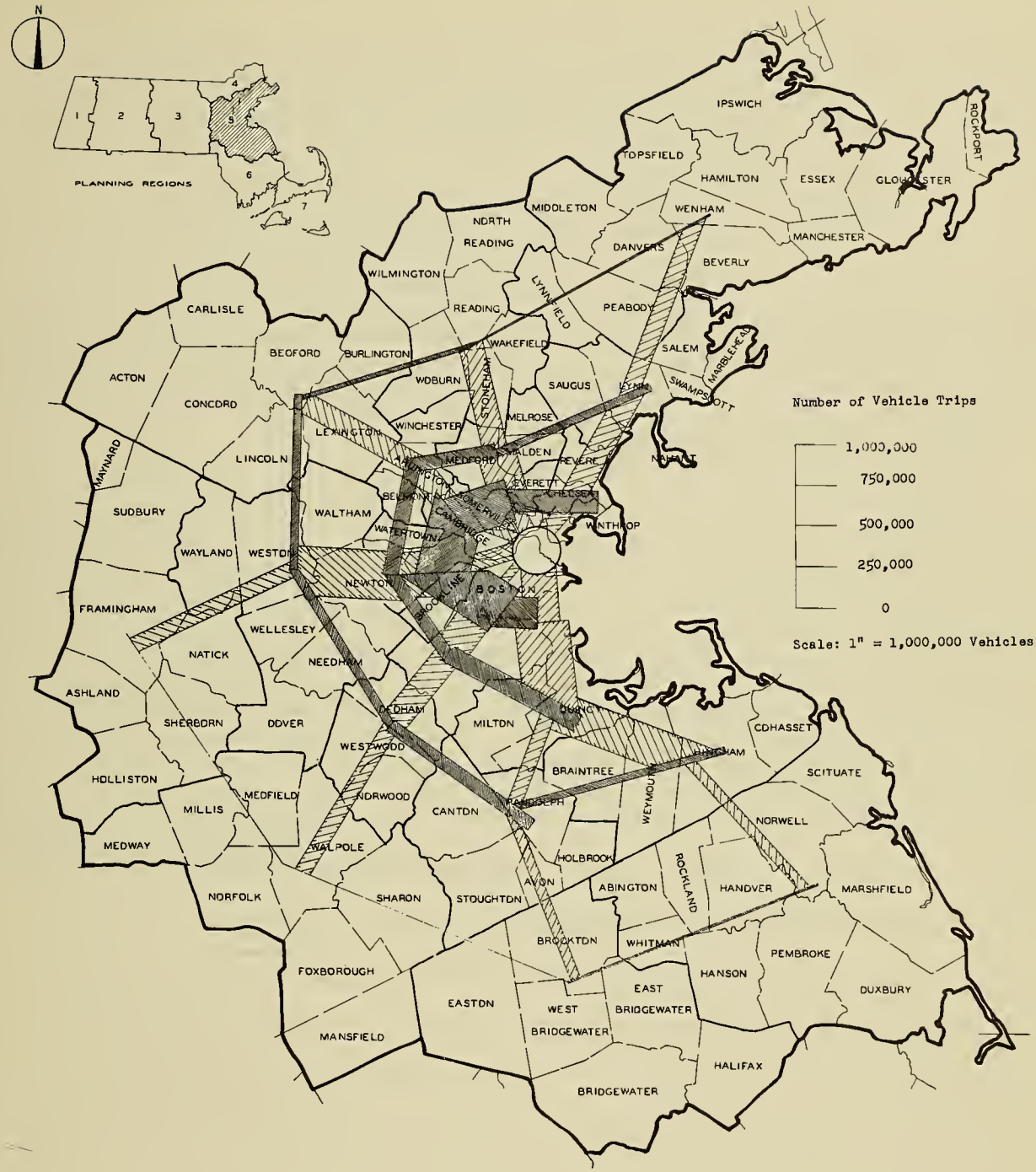
The majority of the volume shown on section EA of 68,000 vehicles per day would make use of the section EB of the Inner Belt. In other words, the Downtown-bound vehicles on the Northern expressway would use the Inner Belt from the Sullivan Square, Charlestown Area to the Central Artery near the North Station.



MAP IX

1959 CIRCUMFERENTIAL TRAFFIC FLOW *

* Two Directional Flow of Total Daily Motor Vehicle Trips



MAP X

1980 CIRCUMFERENTIAL TRAFFIC FLOW *

* Two Directional Flow of Total Daily Motor Vehicle Trips

This would raise the volumes on section EB of the Inner Belt to between 125,000 and 130,000 vehicles (two directions) per day -- or up to the design capacity.

Similarly, the volumes shown on section OA would tend to use section OS of the Inner Belt from Roxbury to the Fort Point Channel of the Central Artery. This would raise the daily volumes of this section of the Inner Belt to between 125,000 and 135,000 - an amount greater than design capacity.

On the other hand, it is possible that a capacity greater than 15,000 vehicles per day per lane can make use of this facility if it is well designed. If the capacity per lane were assumed to be 20,000 vehicles per day, the total eight lane capacity of 160,000 would still be less than the high volumes on the two sections HK and KO between Cambridge and Roxbury.

The 1980 assigned volumes shown on Map X) are astronomically high. One section (HK) shows a volume that is twice as great as the practical capacity of 160,000 vehicles per day.

Considering that the majority of the flows on the radial routes EA and BA are reassigned to the Inner Belt and then the Central Artery (the remainder to local streets) the volumes on the Inner Belt in 1980 would be as follows (in contrast to the maximum capacity of 160,000 vehicles per day):

Section BE (Charlestown to Somerville) approx. 235,000
Section EH (Somerville to Cambridge) approx. 265,000
Section HK (Cambridge to the Fens) approx. 325,000

Section KO (the Fens to Roxbury) approx. 308,000

Section OS (Roxbury to Fort Point Channel) approx. 250,000

These 1980 volumes immediately suggest that two Inner Belts are necessary.

However, two Inner Belts are expensive - prohibitively so, because of their width and location in the highly developed area near Downtown Boston. Instead of considering further the need for two Inner Belt routes circumventing Downtown Boston, this analysis has investigated a number of alternative and less disrupting and expensive possibilities that are expected to be sufficient to meet 1980 needs. These are referred to throughout the remaining text. The major intent is to fulfill the circumferential and crosstown travel and volume requirements with the least expense and in a way that provides a complete and flexible expressway network.

AN INTERMEDIATE BELT CIRCUMFERENTIAL

It has been noted previously that the sections of the assignment network duplicate the locations of the proposed regional expressway system in all cases except that some additional sections were added to the network to complete the geographic system. These additions include the radial sections of BA, HA and OA from the Inner Belt into Downtown. In addition, the circumferential sections CF, FI, IL, LP and PT were added for investigating purposes. These circumferential sections approximate a highway facility on or near Route 16 from Revere to Belmont, through western Brighton or eastern Newton to the location of the Hammond Pond Parkway, and then the West Roxbury Parkway, and eventually to Mattapan or Neponset Circle in Dorchester.

The resultant assigned 1959 flows on this intermediate circumferential justify a relatively large capacity facility. The volumes shown on Map IX are greater than the capacity of an on-the-surface highway or arterial which must mix with and cross other surface traffic. These 1959 volumes are almost large enough to consume the design capacity of a four lane limited access expressway (two lanes in each direction).

The 1980 assigned volumes (Map X) are large enough to consume the capacity of a six lane expressway. The only exception is that section of the circumferential that lies between Medford and Revere.

These volumes indicate an immediate need of a medium size limited-access facility and a 1980 need for a high capacity facility.

But of particular interest is the opportunity to relieve the Inner Belt of excess volumes. This is entirely possible and an event to be expected and planned for. Many of the vehicles assigned to the Inner Belt originate in and are destined for areas located near or beyond (outside) the location of this intermediate circumferential. In the assignment procedure, they have been placed on the Inner Belt because of its central location and therefore, the fact that it offers the shortest possible trip. However, once these drivers realize that the Inner Belt will be filled to capacity, they will use a circumferential further out. The trip may result in slightly longer mileage (because of the geography) but a shorter travel time because of less congestion.

It is entirely logical that the great majority of excess 1959 and 1980 volumes on the Inner Belt can be satisfied by this intermediate circumferential belt.

Analysis of this possibility indicates that an eight lane (four in each direction) limited access expressway located on the approximate route of the sections shown would not have a large enough capacity to fully relieve the Inner Belt when the excess 1980 Inner Belt volumes are combined with the assigned volumes on the Intermediate Belt. Only in the case of section CF, from Medford to Revere, would an eight lane facility be adequate to fully relieve its counterpart section of the Inner Belt.

An Intermediate Belt facility is distinctly required to handle Inner Belt excess and its normally assigned flows. If it

existed today it could be expected to carry volumes at least as large as indicated below (the figures are a combination of assigned traffic and traffic diverted away from the Inner Belt):

	1959 Daily MV Volume
Section CF (Revere to Medford)	30,000
Section FI (Medford to Watertown)	50,000
Section IL (Watertown-Brighton to Newton)	80,000
Section LP (Brighton-Newton to Roslindale)	70,000
Section PT (Roslindale to Dorchester)	55,000

These figures are to be compared with a design capacity of 60,000 vehicles per day and a maximum capacity of 80,000 vehicles per day for a four lane expressway (two lanes for each direction).

In 1980 the possible volumes on this facility would be as follows (figures are a combination of assigned flows plus the diversions from the Inner Belt):

	1980 Daily MV Volume
Section CF (Revere to Medford)	130,000
Section FE (Medford to Watertown)	200,000
Section IL (Watertown-Brighton to Newton)	250,000
Section LP (Brighton-Newton to Roslindale)	230,000
Section PT (Roslindale to Dorchester)	200,000

These volumes are to be compared with a maximum capacity of an eight lane expressway (four in each direction) of about 160,000 motor vehicles per day).

The diversions from the radial routes and the Inner Belt in

1980 will cause excessive volumes on this facility, also. The moving-out process can be continued by reassigning some trips using the Intermediate Belt to Route 128. This moving out process is something that occurs even today. A substantial amount of cross-town travel in Metropolitan Boston now moves outward to Route 128 to enjoy easier travel instead of heading inwards where congestion is greater. The pattern of origins and destinations in the region demonstrates that diversion use of an Intermediate Belt, Route 128 and an Outer Belt is not only possible but necessary to minimize the heavy volumes expected in the inner parts of the region.

ROUTE 128

The Golden Belt of Metropolitan Boston has proved its usefulness in serving circumferential flow. There is every expectation that it will continue to be one of Metropolitan Boston's most well used and renowned expressways.

The volumes assigned to Route 128 as shown on Map IX are considerably less than are actually experienced today - particularly on the northern half of the arc. This is because:

1. External trips originating outside of Metropolitan Boston and destined beyond Metropolitan Boston are not included in the volumes. These are heavy flows, especially during the Summer months. The existence of the Outer Belt from Southboro, Northboro to Haverhill and Amesbury has been assumed as diverting much of this traffic away from Route 128.

2. The existence of the Inner Belt and the Intermediate Belt in the assignment procedure has also diverted much traffic away from Route 128. This is traffic that would prefer a more direct freely moving flow if it were available, but which will go out to Route 128 because of the lack of a better facility. In the assignment process much of this traffic has been assigned to the Inner Belt and the Intermediate Belt. But in the process of adjusting these assigned flows out again because of heavy volumes on these inner belts the volumes on Route 128 would become high again. In other words, the Inner and Intermediate Belts allowed shorter, more direct trips for many Route 128 users.

3. The travel assigned only includes those trips going an average of 5.5 miles or more. There are many local trips (intra-traffic-area trips) that would use Route 128. For example, a trip from Weston to Needham or Dover has been eliminated from expressway assignment and is not included despite the fact that a share of such a trip would be made on Route 128.

To modify the rather strict adherence to assigning only longer trips to expressways, and to compensate for the larger traffic areas that are delineated in the outlying suburbs, one-half of the trips made from a traffic area located on Route 128 to an adjacent traffic area on Route 128 have been included in the traffic assignments on Map IX.

To illustrate the implications of continuing this moving-out process, the excess traffic from the filled-up Intermediate Belt was combined with the traffic normally assigned to Route 128. The resultant 1980 volumes using Route 128 would be as follows:

Section DG (Peabody to Wakefield)	20,000
Section GJ (Wakefield to Burlington)	80,000
Section TM (Burlington to Newton)	135,000
Section MQ (Newton to Dedham)	125,000
Section QV (Dedham to Canton)	100,000
Section VW (Canton to Weymouth)	65,000

These volumes are to be compared with a Route 128 design capacity (assuming six lanes for the entire length) of 90,000 vehicles per day and a possible capacity of 120,000 motor vehicles

per day. For the most part these expected volumes can be accommodated by Route 128. Those that cannot must be served by local streets.

The group of four circumferential expressways discussed above (the Inner Belt, the Intermediate Belt, Route 128 and the Outer Belt) are capable of handling all the crosstown and circumferential travel (except local trips) expected to occur by the year 1980. All four routes are needed now.

The volumes expected on the Inner Belt and Intermediate Belt will require that each of these facilities be eight lanes in width; four in each direction. The full eight lanes of the Inner Belt are needed immediately. At least four of the eventual eight lanes of the Intermediate Belt are needed immediately, the remaining four would be needed well before 1980. The figures also indicate that eight lanes will eventually be necessary on the two middle sections of Route 128 south and north of Newton unless other major streets are improved to accommodate this flow.

Recommendations - Circumferential Expressways

1. The Inner Belt first proposed in 1948 and rejustified by every other traffic and transportation study since as a necessary expressway circumventing the Downtown area at a distance of about two miles is identified by this analysis as the single-most important section of the required expressway system in Metropolitan Boston. The regional system will not function without an Inner Belt completed from Charlestown, through Cambridge and Roxbury to the Fort Point Channel.

It is recommended that this facility - eight lanes in width - be given the highest possible priority.

2. Because of the importance of circumferential flow, the great excess volumes that will attempt to utilize the Inner Belt, and the need to relieve many sections of the radial system by diversion, it is further recommended that immediate consideration and planning be allocated to the construction of an INTERMEDIATE BELT. This should also be designed for eight lanes, although the expected volumes show that six lanes would be adequate for the immediate future.

It is proposed that this facility should entirely circle the inner part of the Metropolitan area at an average distance of 4-5 miles from Downtown Boston. This would place it between the Inner Belt and Route 128 (but slightly nearer the Inner Belt) through areas that currently contain many acres of open space but which in the near future will become heavily developed.

It is of extreme importance that this Intermediate Belt be fully connected with all other expressway facilities that it crosses.

It is recommended that this route have a general location that would place it through Revere, Medford, Belmont, Watertown, Brighton or Newton, outer Brookline, West Roxbury-Roslindale, and Dorchester.

3. The volumes assigned to Route 128 indicate that the two circumferential routes mentioned above will help relieve Route 128 traffic for a period of time but that industrial development, suburban development and long distance inter-regional flows will consume all the space available.

REGIONAL RADIAL SYSTEM

MAP XI

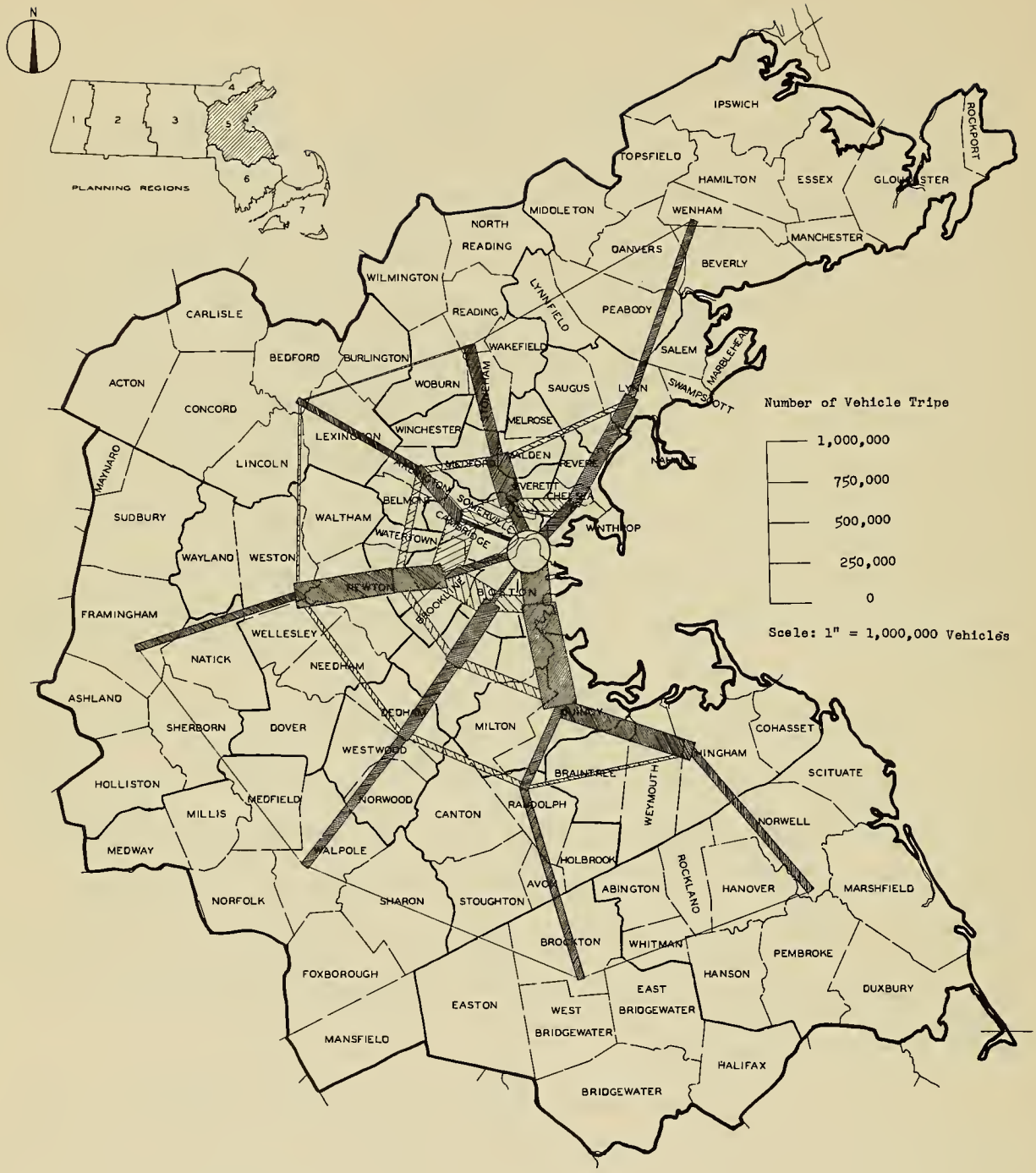
REGIONAL BOSTON EXPRESSWAY SYSTEM

RADIAL CHANNELS

The radial routes of the regional expressway system are the facilities that to date have received most of the attention of highway builders in this area. Two already are in operation; the Northeast and Southeast Expressways. Another, the Northern Expressway, is under construction and rapidly approaching the Downtown area. The Toll road extension from the West has recently been deferred. Storrow Drive, the Northern Artery, Morrissey Boulevard, the Mystic River Bridge and a new Sumner Tunnel are all major post-war improvements. And of course, all of these facilities feed directly or indirectly into the Central Artery.

These radials converge on Downtown Boston and make it by far the most accessible part of the entire region. The general design of the expressway system yet to be constructed further emphasizes the centralized location of the Central Business District. Thus, the expressway system is generally consistent with the regional pattern of population densities and commercial and industrial development.

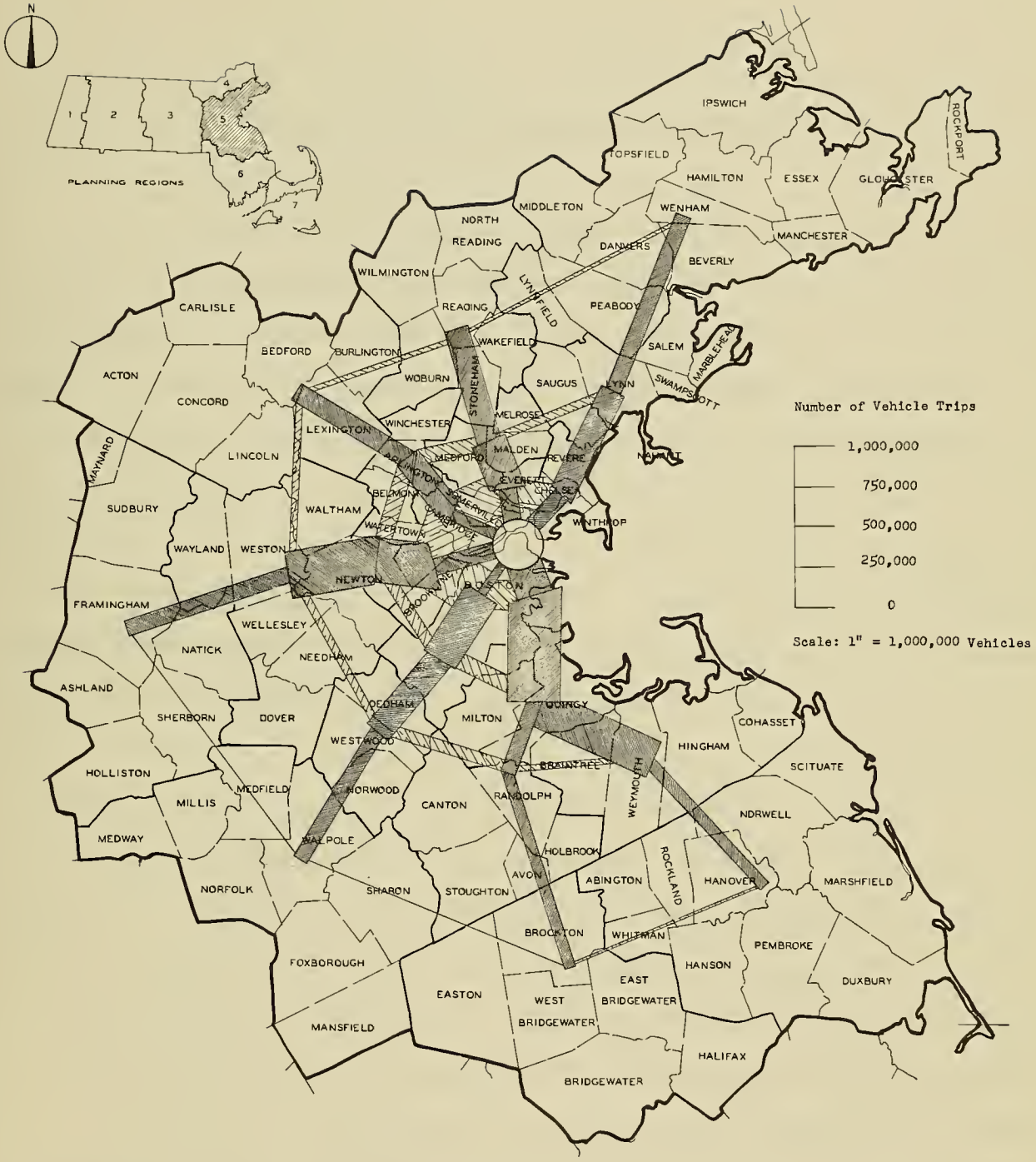
The volume of traffic on the expressways shows that such radial routes are generally fully justified - as long as they provide connections to a sufficient number of circumferentials. These volumes include a substantial number of vehicles traveling to the Downtown area. Interestingly enough, however, of the total trips assigned to the radial expressway sections just beyond the Inner Belt location (where volumes are heaviest) only between 20% and 40%



MAP XII

1959 RADIAL TRAFFIC FLOW *

* Two Directional Flow of Total Daily Motor Vehicle Trips



MAP XIII

1980 RADIAL TRAFFIC FLOW *

* Two Directional Flow of Total Daily Motor Vehicle Trips

are bound for the Downtown area. The trips on these radials not bound for Downtown have destinations that require use of a circumferential.

However, the volumes that are shown on the radial routes just inside the Inner Belt are composed almost entirely of trips destined for, or originating in the Downtown area. The exceptions are those trips going through Downtown. (The volumes shown on Maps XII and XIII do not include transit riders bound for Downtown.)

The volumes assigned to the radial routes as shown on Maps XII and XIII have been adjusted for various given and probable circumstances as described below. These modifications are necessary to understand and design a workable transportation system which maintains a proper balance between expressways, highways, transit and parking lots.

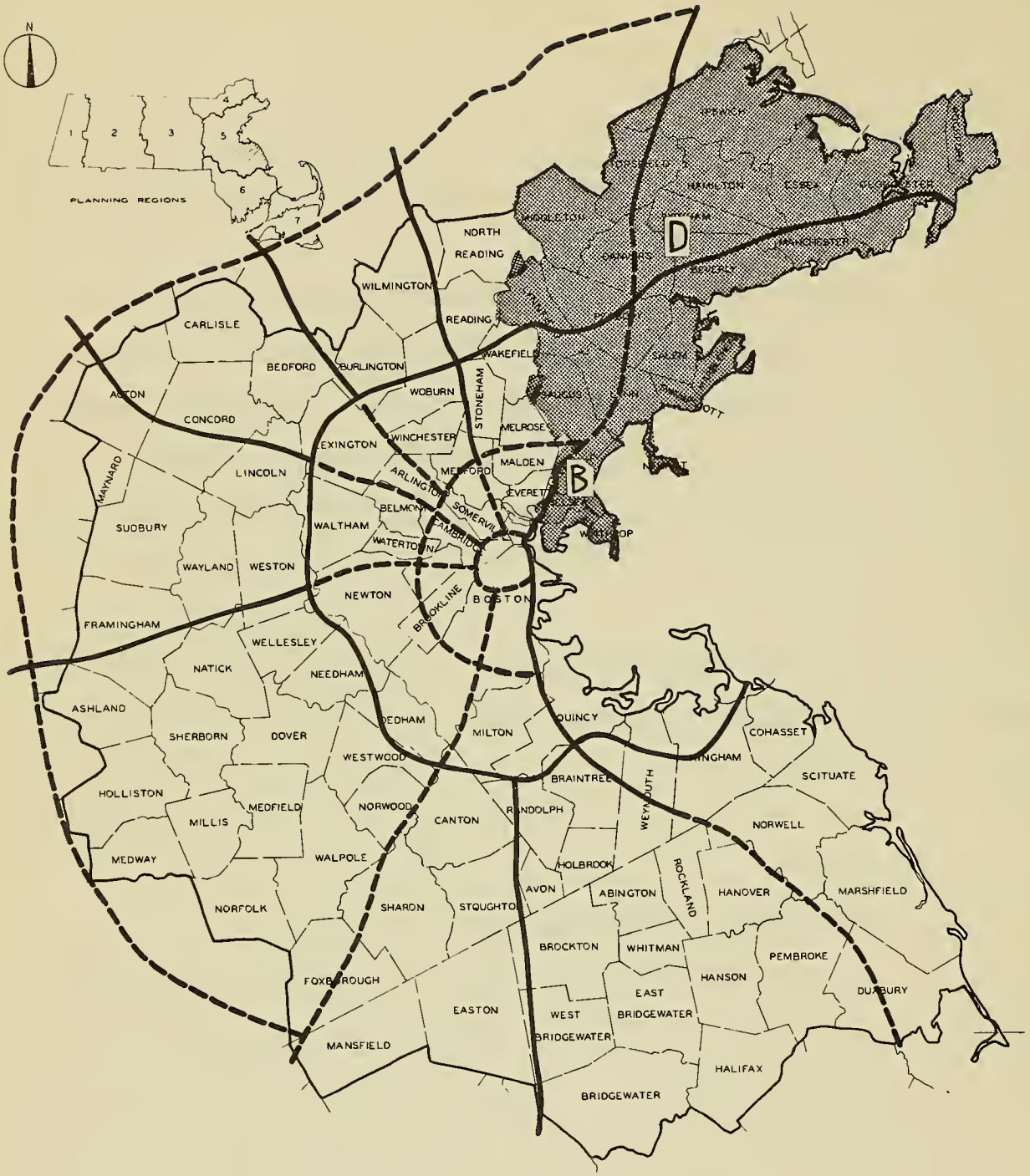
A general review of the radial expressways, their volumes and capacities, shows that each radial, if in existence today, would have sections that would be used to full capacity. In the case of all radials those sections just beyond the Inner Belt would be immediately fully loaded. The volumes show about what actually happens daily on the two radial expressways that now exist: the Northeast and Southeast Expressways. The traffic assignments show a 1959 volume on the Southeast Expressway that greatly exceeds design capacity. The assignments show a volume on the Northeast Expressway that is a little less than design capacity. The volumes on the Central Artery are also greater than

capacity despite the fact that the assignment procedure assumed the existence of the Inner Belt.

In 1980 the traffic conditions on the radial routes, as in the case of the circumferentials, will be much more crowded. The volumes assigned show that almost every part of every radial channel exceeds the capacity of a limited access expressway. Many sections of the radial system greatly exceed their capacity and cannot possibly accommodate the amount of travel expected to occur.

There are ways and means of ameliorating these congestion conditions and prospects. Those means that must be given consideration are as follows:

1. Plan to build many more expressways than heretofore imagined.
2. Develop and extend rapid transit lines.
3. Formulate plans and programs for economic development that help spread the automobiles around rather than concentrate them at future points of expected congestion.
4. Construct a minimum expressway syatem that is designed so as to maximize use of all expressway sections rather than concentrate the travel patterns.



MAP XIV

REGIONAL BOSTON - NORTHEAST SECTOR

I. The Northeast Sector

The Northeast Sector of the Boston Region is shown on the map opposite. The sector contains 23 communities having a present population of 491,473, and an expected 1980 population of 596,200. The rate of growth of population in this area is less than most of the other sectors of the region. However, because this sector is bounded on one side by the Atlantic Ocean, it does not share as great a number of jobs as other sectors and thereby emits a greater proportion of its daily travelers toward and to Downtown Boston. Also, because no other transportation facilities exist to the east, the Northeast sector contains a high proportion of travelers who pass through Downtown Boston toward other destinations.

The major transportation facilities now serving the area are: the Northeast Expressway, the Mystic River Bridge, the Sumner Tunnel, Interstate Route #95 from Danvers north to the New Hampshire state line, Route 128, and the Metropolitan Transit Authority East Boston-Revere Rapid Transit line. Other important facilities are: highway routes #1, #1A and #C1; Western Avenue (Route #107) in Lynn; the Eastern Massachusetts Street Railway Company; and, the Boston and Maine Railroad.

The major transportation problems of the recent past in this sector have centered around: the difficulties of crossing Boston Harbor and the Mystic River; the heavy volumes of traffic between the Metropolitan Area and the North Shore during Summer weekends; and, special event traffic attracted to the two race tracks in East Boston and Revere.

The problems have been fully accounted for by the construction of more major transportation facilities than in any other sector. Post war construction has consisted of: the Mystic River Bridge, the Northeast Expressway, Interstate Route #95, the Revere MTA Rapid Transit Line, and currently the construction of the second tube of the Sumner Tunnel.

The only missing element in the heretofore planned transportation network in this sector is the extension of the Northeast Expressway to connect with Interstate Route #95 in Danvers.

SECTION AB

Section AB is the radial approach into Downtown Boston from the East Boston-Revere-Chelsea area. The transportation facilities that serve this area are the Sumner Tunnel-East Boston Expressway combination, the Northeast Expressway-Mystic River Bridge-Central Artery combination, and the East Boston-Revere Rapid Transit line.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	75,000
Plus - Local Traffic to Downtown to be added because of necessary harbor crossing	35,000
Total	110,000
Capacity: Sumner Tunnel (4 lanes) and Mystic River Bridge - Central Artery connection (4 lanes)	120,000 - 160,000
1980	
Assigned Volumes	110,000
Plus - Local Traffic to Downtown	30,000
Total	140,000
Capacity: Sumner Tunnel (4 lanes) and Mystic River Bridge - Central Artery connection (4 lanes)	120,000 - 160,000

The 1959 volumes from the Northeast Sector can easily be handled by facilities that exist or are under construction even when local traffic from East Boston, Chelsea, Winthrop and Revere is included. The 1959 volume of 110,000 motor vehicles per day is slightly higher than existing counted volumes because the present design of these facilities does not provide full capacity. The second tube of the tunnel is not yet opened and the connection

between the high level bridge over the Charles River, the Charlestown area and the Mystic River Bridge is confined to four lanes (both directions). This restricts the total capacity to some 100,000 motor vehicles per day.

This Mystic River Bridge-Central Artery four lane restriction joining two six lane sections of the expressway network is the single biggest design bottleneck in the entire regional expressway system and daily creates traffic jams that impair the usefulness of the entire Interstate Route 95, It will remain a bottleneck until the Inner Belt is constructed to help divert the heavy crosstown and through traffic around Downtown Boston, and until other supplementary expressway and surface facilities are constructed to provide the capacities necessary. The North Terminal Area Committee has initiated a study of this entire problem.

To the volumes indicated above must also be added the flows assigned to the radial Section AE between Downtown Boston and the Northern Sector, which heretofore has not been a planned section of the expressway network. The Northern Expressway has been designed to connect directly into the Central Artery. The 1959 volumes are as follows:

Assigned - from the Northeast	75,000
Local Traffic - crossing harbor	35,000
Assigned from Northern sector-Section AE	68,000
Total 1959 daily volume	178,000

Capacity	6 lane Central Artery and 4 lane Sumner Tunnel	150,000 - 200,000

Therefore it can be concluded that if the entire expressway system were in operation, the northern part of the Central Artery, the Mystic River Bridge and the Sumner Tunnels could accommodate all 1959 volumes from the Northeast and Northern sectors with full use of all capacity. The highways would be crowded, to be sure, but the system would work. It is to be noted that this workability statement is in reference to the expressway sections as they enter Downtown Boston. The utilization of the Central Artery within the Downtown area is another matter. Because of its design, it is utilized by many intra-downtown trips which add to its volumes and contribute substantially to traffic congestion.

These expressway facilities are also adequate to accommodate all 1980 traffic from the Northeast Sector; but, as shown below, the 1980 volumes from the Northern Sector (reassigned from section AE) cause excessive flows.

Assigned and local from Northeast Sector	140,000
Reassigned from Northern Sector (Section AE)	105,000
Total volumes - 1980	245,000
Capacity	150,000 - 200,000

Therefore there will be an excess of at least 45,000 vehicles per day. If all through traffic from the north is diverted to the Inner Belt the excessive flows can be reduced to about 20,000 vehicles per day.

Further reductions are difficult to justify. The volumes still exceed the maximum capacities by at the very least, 20,000 vehicles per day, and by a more practical volume of 35,000 to 45,000 vehicles per day.

SECTION BC

Section BC between the Inner Belt, Central Artery, Mystic River Bridge Area and the Lynn-Saugus Area is that assignment section equivalent to the Northeast Expressway and Routes 1, 1A and C1 joining the East Boston Expressway (See Map XIV).

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes (both directions)		90,000
Capacity:	Northeast Expressway	90,000 - 120,000
	Route C1 or Route 1 North of Revere	30,000 - 40,000
	Total Capacity	120,000 - 160,000
1980		
Assigned Volumes (both directions)		153,000
Capacity:	Northeast Expressway	90,000 - 120,000
	Route C1 or Route 1	30,000 - 40,000
	Total capacity	120,000 - 160,000

Because of the traffic volumes foreseen for 1980, there will be an eventual need in this area to divert some part of this traffic to other facilities. The existence of an Intermediate Belt could accomplish this diverting objective and allow those with crosstown movements to stay off the more crowded radial expressways. Such a facility would be particularly useful during heavy traffic weekends.

SECTION DC

Section DC is equivalent to the yet unconstructed expressway between the Saugus-Lynn Area and Interstate Route 95 in Danvers. The facility that now serves most of this traffic is Route 1.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes (both directions)	47,000
Capacity: Northeast Expressway Extension	90,000 - 120,000
1980	
Assigned Volumes (both directions)	98,000
Capacity: Northeast Expressway Extension	90,000 - 120,000

The figures indicate that Section CD will be adequately served by the extension of the Northeast Expressway. For daily travel the capacity of this expressway and those major highways that now exist will allow free flowing traffic at all times. The additional traffic on Summer weekends will consume practically all of the capacity available and in some instances will cause congestion.

Conclusions - Northeast Sector

1. The facilities entering Downtown Boston, consisting of the Mystic River Bridge, Central Artery and a four lane Sumner Tunnel, are generally adequate to handle 1980 traffic volumes.
2. The Central Artery-Mystic River Bridge section of the Expressway System will not be capable of handling all of the additional flow from the Northern Expressway (Interstate Route 93).
3. This part of the Expressway System will prove to be the single biggest bottleneck in the entire expressway network until the Inner Belt is completed to divert large quantities of crosstown traffic around rather than through the heavily congested sections of the Central Artery and Downtown Boston streets.
4. The most serious element of the transportation system in the Northeast sector is the area north of the Chelsea-East Boston zone. But even here the maximum capacities of the Northeast Expressway and Routes 1 and 1C will not be exceeded even by 1980.
5. The existence of an Intermediate Belt would - as in the case of the Inner Belt - prove justified as a means of minimizing radial flows at all times, but particularly during seasonal and special traffic peaks.
6. The extension of Interstate Route 95 - the Northeast Expressway - from the Revere Airport to Interstate 95 in

Danvers will be needed in the immediate future and should be constructed to fill in the remaining gap in the expressway system to the northeast.

7. With the completion of Interstate Route 95, the 1980 expected volumes will not be great enough to overtax the facilities then in existence. Even at that time the nature of the expected volumes is such that relatively minor improvements will serve to maintain an adequate transportation system.

8. Since the facilities in this sector are sufficient to accommodate the present number of Downtown-bound travelers, major transit improvements in the area are not required immediately. However, in view of the expected increase in traffic, some improvements will be required in the near future.

Recommendations: Northeast Sector

1. The Northeast Expressway should be extended as an originally planned section of the Federally-financed Interstate system from the Northeast Expressway near Revere Airport to the existing limited access Interstate Route #95 in Danvers, thus completing the radial network in this area. However, the design of this section should be coordinated with:

   a. the possibilities of an MTA rapid transit extension and terminal parking areas in the Revere-Saugus marshes area; (see below)
   b. the Revere-Saugus marshes area becoming the terminus of the Intermediate Belt.

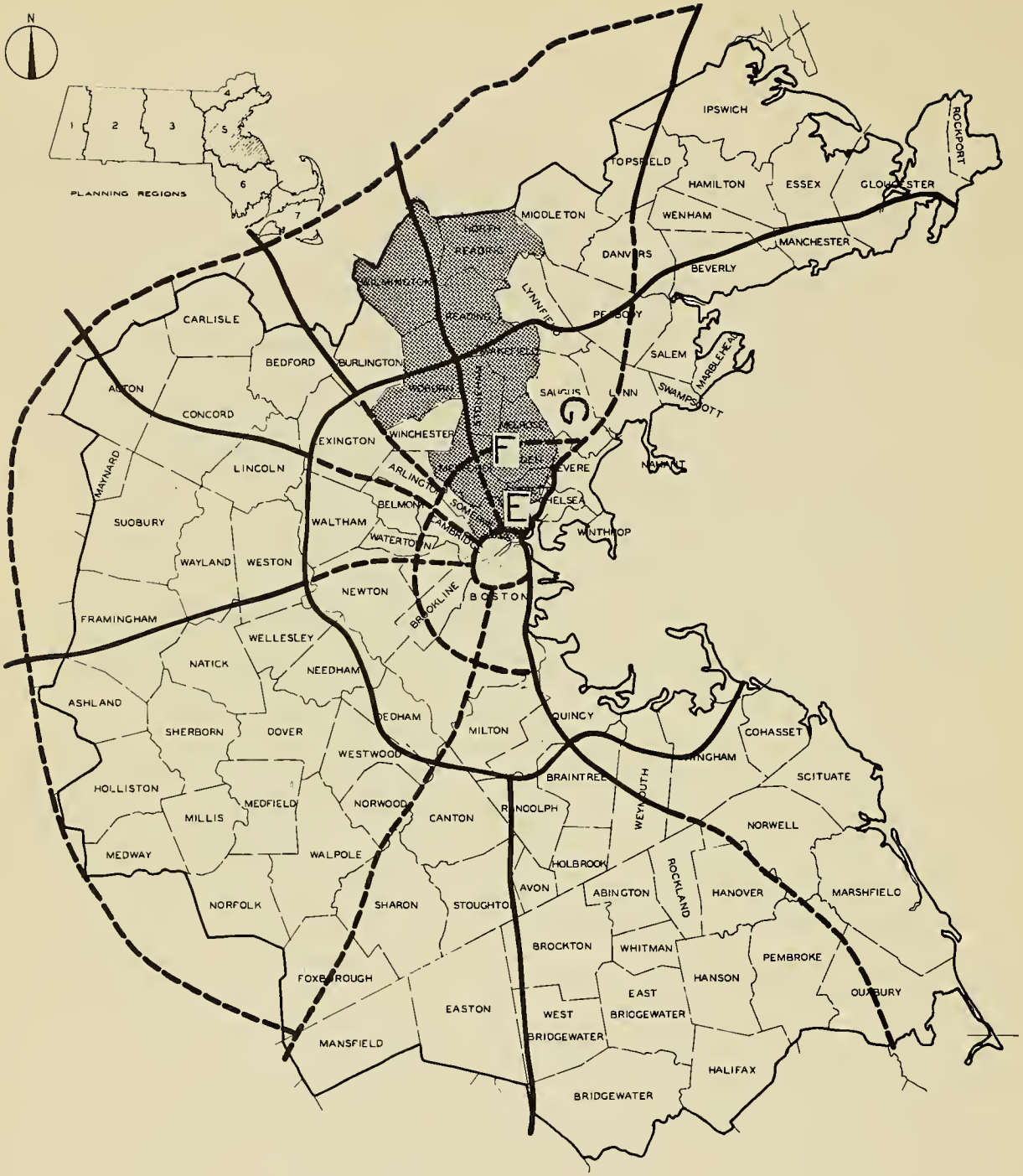
2. The greatest single bottleneck in the entire regional expressway system is the area where the Mystic River Bridge, the Central Artery, the Northern Expressway, the Inner Belt, Storrow Drive and Memorial Drive all join together. This bottleneck - the North Terminal Area - should be the subject of immediate study, with the view of improving and coordinating all transportation facilities in the area and providing for its future growth and development.

3. The Inner Belt from the Central Artery in Charlestown to the west and south should be planned and constructed as soon as possible and in a manner consistent with the findings of the North Terminal Area Study.

4. Immediate consideration should be given to, and detailed cost

studies should be made of, an extension of the East Boston-Revere MTA Rapid Transit line about two miles to the Revere-Saugus marshes area where coordinated highway-transit design can provide full access between large MTA terminal off-street parking areas and the many expressway facilities being proposed for this area. Extension of this transit line beyond this terminal parking area does not appear justified.

5. Major radial streets and highways in this sector should be constantly modernized and maintained as high capacity streets through the enactment of up-to-date traffic engineering standards.



MAP XV

REGIONAL BOSTON - NORTHERN SECTOR

II. The Northern Sector

The Northern sector of the Boston Region is shown on the map on the opposite page. This sector extends from Charlestown and Somerville north to Wilmington and North Reading. It has a current population of 391,740 persons and can expect a growth by 1980 of 17%.

This sector is now served by the Northern Artery, the Fellsway, and numerous major streets. In addition, the area is served by the Everett rapid transit line, partly by the Lechmere line of the MTA, and by the mainline of the Boston and Maine Railroad.

The major problems of this area are typical of those throughout the region: too little highway capacity with numerous surface bottlenecks; decreasing railroad commuter service; and, a transit line that extends only three miles from Downtown Boston.

Construction of new expressway facilities in this area is nearing completion. The Northern expressway, connecting the Central Artery and the Inner Belt with Route 128 and the City of Lawrence, is well under way. The sections from Medford north are almost completed. The section from Medford to the Inner Belt is expected to be under full construction in the near future.

SECTION AE

Section AE is equivalent to an expressway from the Charlestown-Everett-Somerville area direct to Downtown Boston. No expressway now exists nor is one planned. Instead, the Northern Expressway is designed to connect onto the Central Artery at the high level bridge over the Charles River.

The Northern Artery, Prison Point Bridge, Charlestown (Washington Street) Bridge and the Charles River Dam are the other facilities that now carry this traffic into Downtown Boston. For all practical purposes the capacity of these surface facilities for Downtown-bound traffic is limited to the capacity of the Charles River Dam Bridge, the Charlestown (Washington Street) Bridge, and part of the space on the Longfellow Bridge. But it must also be recognized that these facilities serve local traffic as well as long distance traffic.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes (both directions)	68,000
Capacity : Northern Expressway[1]	120,000 - 160,000
Northern Expressway and Charles River Dam[2]	70,000 - 100,000
1980	
Assigned Volumes (both directions)	105,000
Capacity: Northern Expressway[1]	120,000 - 160,000
Northern Expressway and Charles River Dam[2]	40,000 - 50,000

1/ Before connection with the Central Artery
2/ After connection with the Central Artery. As previously described this capacity becomes substantially less because of the combing of Mystic River Bridge flows with those of the Northern Expressway.

The expressway system capacity at the connection of the Central Artery, Northeast Expressway (Mystic River Bridge) and Northern Expressway is such that entrance from the Northeast Sector must be allocated as much space as it requires - and only the remainder is available for the flows from the Northern Expressway.

In 1959 the capacities prove adequate to serve all flows from both sectors. However, the greater flows in 1980 from the Northeast Expressway consume greater amounts of the available capacity and leave less for the flows from the Northern Expressway. The capacity remaining is the 40,000 - 50,000 vehicles per day. This situation creates a potential space deficit of 50,000 to 60,000 vehicles.

Even though a greater proportion of crosstown trips are diverted to the Inner Belt, the capacity deficit will remain as great as 35,000 to 45,000 vehicles (See Northeast Sector).

This serious deficit must be accommodated through the construction of additional expressway, major street, and/or transit facilities.

SECTION EF

Section EF is equivalent to the Northern Expressway between Charlestown and Medford beyond the Inner Belt. The other highway facilities in this area are the Northern Artery, the Fellsway, and Route 1 through Everett.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	143,000
Capacity: Northern Expressway (8 lanes)	120,000 - 160,000
Local Facilities	20,000 - 30,000
Total Capacity	140,000 - 190,000
1980	
Assigned Volumes	230,000
Capacity: Northern Expressway (8 lanes)	120,000 - 160,000
Northern Artery, Fellsway and Route 1	20,000 - 40,000
Total Capacity	140,000 - 200,000

The total maximum capacity shown is about equal to the expected longer distance 1959 travel volumes; i.e., the Northern Expressway would be fully used when opened if the Inner Belt existed. It probably will be under-used by longer distance travelers because of the Central Artery bottleneck and overused by local traffic finding it an easier route.

The excessive motor vehicle flows of at least 30,000 vehicles per day (and probably more) in 1980 will require additional facilities as is the case of the inner extension of this expressway - assignment section AE. A substantial part of this 1980 excess volume will be forced onto local streets or diverted onto the Intermediate Belt before entering this congested section of the expressway.

SECTION FG

Section FG is the equivalent of the Northern Expressway from Medford to Route 128,which is now nearing completion.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	78,000
Capacity: 8 lane Northern Expressway	120,000 - 160,000
1980	
Assigned Volumes	152,000
Capacity: 8 lane Northern Expressway	120,000 - 160,000

The Northern expressway in this area can be expected to be well used when opened but the volumes should not exceed design capacity.

By 1980 the use of this facility will increase to the point of full capacity. There is every reason to believe that the expressway at the outer fringes of the metropolitan area will be adequate for many years to come.

Not included in the volumes shown are the flows from the Lawrence area into Boston. These will increase the volumes but not by an excessive amount.

Conclusions - Northern Sector

Expressway and highway facilities in the Northern Sector - including those now under construction - should be adequate to handle current volumes of traffic. The highways can be expected to be filled when opened but this will be a result of excessive local traffic and of the congestion caused by the lack of an Inner Belt and the Central Artery bottleneck.

However, well before 1980, and after the Inner Belt is in operation, the Northern Expressway will not have sufficient capacity to accommodate all the expected longer-distance flows. The sections of congestion will be at the connection of the Northern Expressway and the Central Artery, and on the Northern Expressway between the Inner Belt and the Medford-Malden area. In both instances there will be deficits of space in excess of 30,000 motor vehicles per day; and it is more likely that these deficits will be of the order of 40,000 to 50,000 motor vehicles per day (even though the Northern Expressway is recognized here as an eight lane limited-access facility).

It will be necessary under these circumstances to undertake a large number of major street improvements, and in addition, to create alternative means of travel.

It is to be noted that this radial contains a large number of persons making daily trips to the Downtown area. For this reason, and because of the general layout and heavy volumes of traffic on the expressway network, it is necessary and justified to extend the Everett rapid transit line to near Route 128 and provide large terminal parking areas.

It is estimated that the expressway and major street limitations creates a condition where at least 30,000 person-trips can be attracted to extended mass transit facilities from area beyond the present terminus of the MTA Everett rapid transit line. The majority of these passengers would have origin or destination in the Downtown Area.

Numerous major highway facilities will also require substantial improvement. The Intermediate Belt assumes great importance as a facility to divert much crosstown traffic away from the heaviest-used section of the Northern Expressway between the Inner Belt and the Medford-Malden area. Therefore, its planning and construction should receive immediate attention.

The Northern Expressway and the Inner Belt must be of eight lane capacity and must be connected to good major streets in the Charlestown-Somerville-Cambridge area before it connects with the Inner Belt and the Central Artery. Only through this type of design will many users of the Northern Expressway be able to get off the Northern Expressway before it reaches points of heavy congestion.

The major facilities that must become extended access facilities for the Northern Expressway and provide access to and from Downtown Boston are primarily the Northern Artery and the Sullivan Square-Rutherford Avenue channels. Both of these major routes must be maintained as facilities for longer distance motorists as well as for local trips. It is of primary importance that their capacity be improved to eliminate restrictive bottleneck points.

The importance of the Inner Belt cannot be overemphasized. Without it the Northern Artery will direct all traffic towards the

already congested Central Artery. This situation will prove hopeless. Thus, the Inner Belt, as an alternative route, is vital.

Until all of these improvements are carried out in this sector, every community will find itself burdened with great excesses of automobiles which in the long run will cost more than would properly designed expressways and rapid transit.

Recommendations - Northern Sector

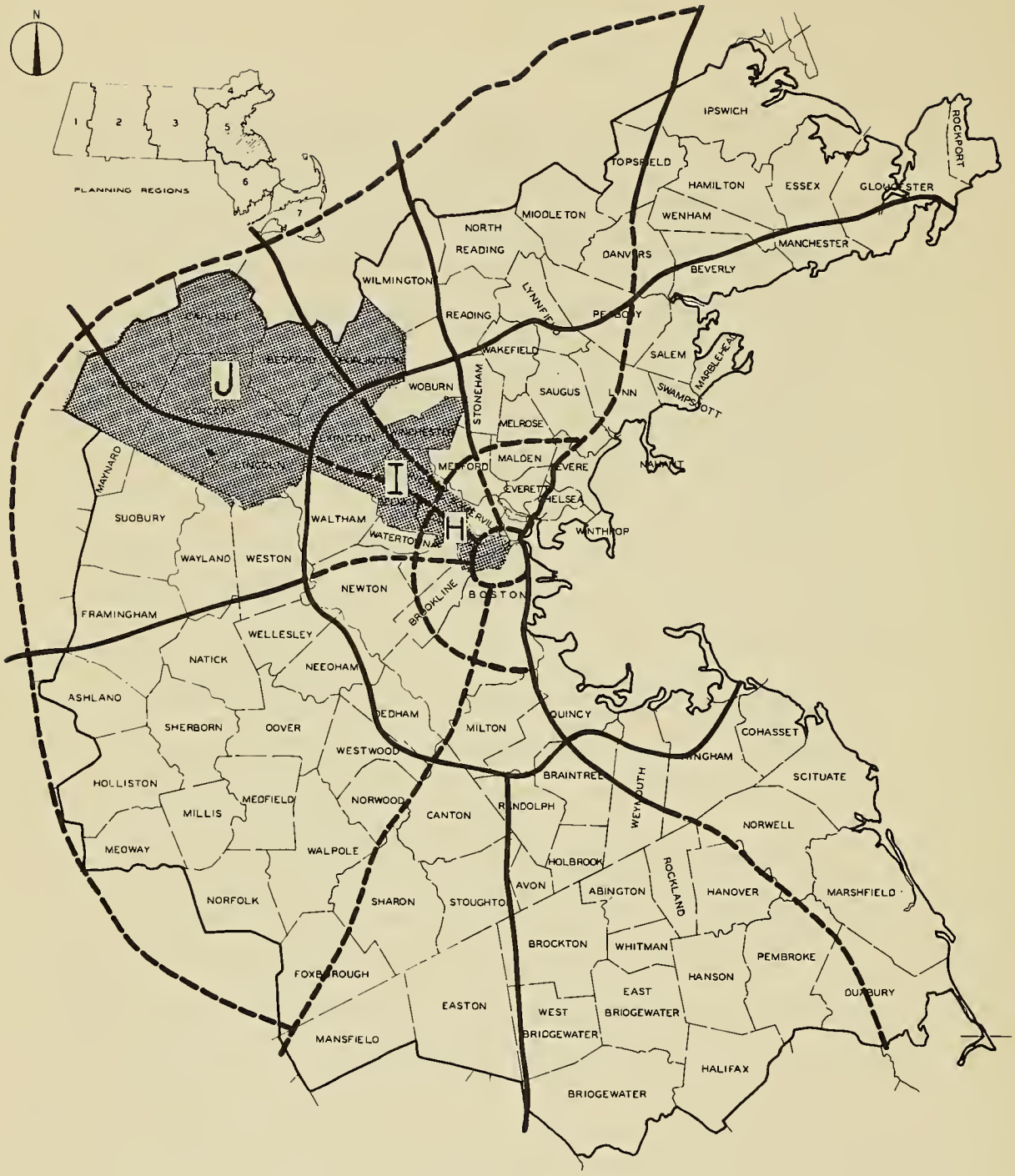
1. The inner most section of the Northern Expressway from Medford to Inner Belt should remain as scheduled for early construction.
2. In recognition of the bottleneck area where the Northern Expressway and Inner Belt connect with the Central Artery, it is necessary that the Inner section of the Northern Expressway include access ramps onto major streets that lead to and through the North Terminal Area to Charlestown, Cambridge and Downtown Boston. These facilities should be located at a point whereby traffic can egress from the Northern Artery before it connects with the heavily used Inner Belt. Those major streets that must be maintained for considerable amounts of through as well as local traffic include Rutherford Avenue, the Northern Artery, Prison Point Bridge and the Charles River Dam.
3. Because the Inner section of the Northern Expressway will be immediately used to full capacity, the Intermediate Belt becomes a necessity to divert crosstown traffic off the inner part of this radial. The Intermediate Belt deserves immediate planning at this point to the Routes 3 and 2 Expressways.
4. Because highways alone cannot accommodate all Downtown and crosstown trips from this sector, an extension of the Charlestown-Everett MTA Rapid Transit Line

is needed in the very near future. This extension should be located along the Mainline of the Boston and Maine Railroad through Malden and the other communities of relatively high commuting to Downtown Boston. The extension should probably terminate near open land adjacent to Route 128 in Wakefield or Reading where large off-street parking areas should be constructed to serve those commuters from more outlying suburbs as well as those from other communities along Route 128 who could find this service attractive. Accessibility between these parking facilities and Interstate Route 93 will provide good service for people in the Lawrence-Andover area.

It is recommended that this extension be high-speed and high-capacity in design. The total distance from Route 128 to Downtown Boston at this point is twelve miles. High speed is required to compensate for this long distance and still provide "rapid" transit.

The design of this extension also involves the possible relocation of the elevated structure in Charlestown. This long awaited event will require careful advanced planning well coordinated with land renewal and development objectives as well as designs for new highways.

5. The combination of major expressway design, major street improvements, land development, and rapid transit improvements all to take place in the one area in and near Charlestown makes it imperative that planning of all improvements be carried out in one major effort. This effort has recently been initiated in the form of the North Terminal Area Study.



MAP XVI

REGIONAL BOSTON - NORTHWEST SECTOR

III The Northwest Sector

The Northwest Sector of the Boston Region is shown on Map #XVI on the opposite page. It extends from Cambridge to Concord, Carlisle, and Acton and is one of the fastest growing sectors of the Boston Region.

Major facilities now available in this sector include Route 2 and Route 3. Residents of the Northwest sector living closer to Boston utilize Storrow Drive and Memorial Drive for access to and from the Downtown area. The area is also served by the Harvard Square and Lechmere MTA Lines, and by the Boston & Maine Railroad.

Highway plans for this sector include a new Route 2 expressway paralleling the present facility and eventually extending through Cambridge to join with the Inner Belt. Also, it is planned to extend Route 3 into the metropolitan area from its present terminus at Route 128, to connect it with a lateral facility (a small section of what has been proposed herein as the Intermediate Belt) to the Northern Expressway and with Route 2, and thence to the Inner Belt. (See Map XI).

Rapid transit extensions in this area have long been discussed, but never realized. The Lechmere PCC line has been proposed for extension to the Winchester area and the Lexington area. The Harvard Square Rapid Transit Line has often been proposed for extension to a number of different communities in this sector.

SECTION AH

Section AH is equivalent to an expressway from the Inner Belt in mid-Cambridge directly to Downtown Boston. No such facility into Downtown has heretofore been planned or programmed as part of the expressway network.

The facilities now serving this traffic demand into Downtown Boston are the Route 2 - Memorial Drive - Storrow Drive combination and parts of the Northern Artery. These routes lead to the Harvard Bridge, Longfellow Bridge and the Charles River Dam crossing of the Charles River.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	32,000
Capacity: Memorial Drive and Storrow Drive	25,000
1980	
Assigned Volumes	67,000
Capacity: Local Facilities (no expressway planned)	30,000

While the 1959 traffic conditions are barely tolerable, the 1980 entrance capacity to Downtown Boston from the Northwest sector will be substantially less than the expected volumes between the Inner Belt and Downtown. As previously indicated, the diversion of this traffic northeastward along the Inner Belt to the Central Artery is basically impossible in view of the expected heavy traffic entering from the Northern Expressway and the bottleneck at the Central Artery. The expected excess volume of 35,000 - 40,000 daily motor vehicles will require some type of major improvement providing access to Downtown Boston.

SECTION HI

Section HI is equivalent to the planned Route 2 expressway between the Belmont - Arlington - Winchester area and the Inner Belt in Cambridge.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		71,000
Capacity:	Route 2 expressway (8 lanes)	120,000 - 160,000
	Local Facilities	20,000 - 25,000
	Total Capacity	140,000 - 185,000
1980		
Assigned Volumes		162,000
Capacity:	Route 2 expressway (8 lanes)	120,000 - 160,000
	Local facilities	20,000 - 25,000
	Total Capacity	140,000 - 185,000

The comparison of 1959 volumes and capacities in this area demonstrates that existing local facilities are very much inadequate, but the construction of the Route 2 Expressway will provide more than enough space for current traffic volumes.

By 1980 the expected traffic volumes will exceed design capacity of these expressway and local facilities but will not exceed maximum capacity.

SECTION IJ

Section IJ is equivalent to the two planned expressways extending northwest from the Belmont-Arlington-Winchester area to the Concord-Burlington area. These expressways are Route 2 and Route 3 as located on Map XI .

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		43,000
Capacity:	Both planned expressways (4 lanes each)	120,000 - 160,000
	Existing Routes 2 and 3	40,000
1980		
Assigned Volumes		128,000
Capacity:	Both expressways (4 lanes each)	120,000 - 160,000

This section of the radial expressway system will have adequate capacity for the expected 1980 volumes when the two expressways are completed with 4 lanes on each facility.

Conclusions - Northwest Sector

The construction of the planned expressways - Route 2 from the Outer Belt to the Inner Belt, and Route 3 from Route 128 to the Intermediate Belt will alleviate most of the travel problems in this sector for many years to come. These facilities plus the Inner Belt and Intermediate Belt can be expected to remove from congested streets practically all longer distance crosstown travelers.

The one remaining problem, however, is of a serious nature. The lack of a radial expressway from the Inner Belt in mid-Cambridge to Downtown Boston will force many persons destined for Downtown onto major streets and the Inner Belt. For this reason the major streets connecting Cambridge with Downtown Boston must be continually maintained and improved to handle substantial amounts of Downtown-bound traffic. These facilities alone will not be capable of providing enough good access for all of the excess volume of 35,000 - 40,000 motor vehicles.

Some of these travelers are potential mass transit users who now find the terminus of the Harvard Square and Lechmere MTA lines too congested and far removed for convenient use. It is estimated that 15,000 to 20,000 persons would be attracted to one of these MTA lines when it becomes more available by extension to a new terminal and parking area in the Arlington-Belmont area.

Recommendations - Northwest Sector

1. The expressway Routes 2 and 3 should eventually be constructed from Route 128 to the Intermediate Belt but should be assigned a lower priority than other highway and transit facilities mentioned.

2. The Intermediate Belt should be constructed to help divert as much traffic as possible away from the inner areas, and to provide access to the Northern Expressway and the inner part of the Route 2 expressway.

3. The inner part of the Route 2 expressway from the Intermediate Belt to the Inner Belt should be constructed as soon as possible.

4. Studies should be undertaken immediately to determine which of the following is most economically justified, from a cost point of view, to handle an expected volume of 15,000 additional transit patrons from and to the outer suburbs of this sector.

   (a) Extension of the Lechmere M.T.A. line to the North Cambridge-Route 2 area and, if later justified, to Lexington along the Boston and Maine roadbed;

   (b) Extension of the Harvard Square rapid transit line to the same area.

   Only one of these extensions appears necessary, but some extension is vital. If the extension from Lechmere is decided upon, it should be planned in coordination with the North Terminal Area and the Civic Center in Boston. Whichever extension is decided upon, it should be designed so as to:

   i. Carry at least 15,000 daily riders from areas I and J in addition to short distance riders and

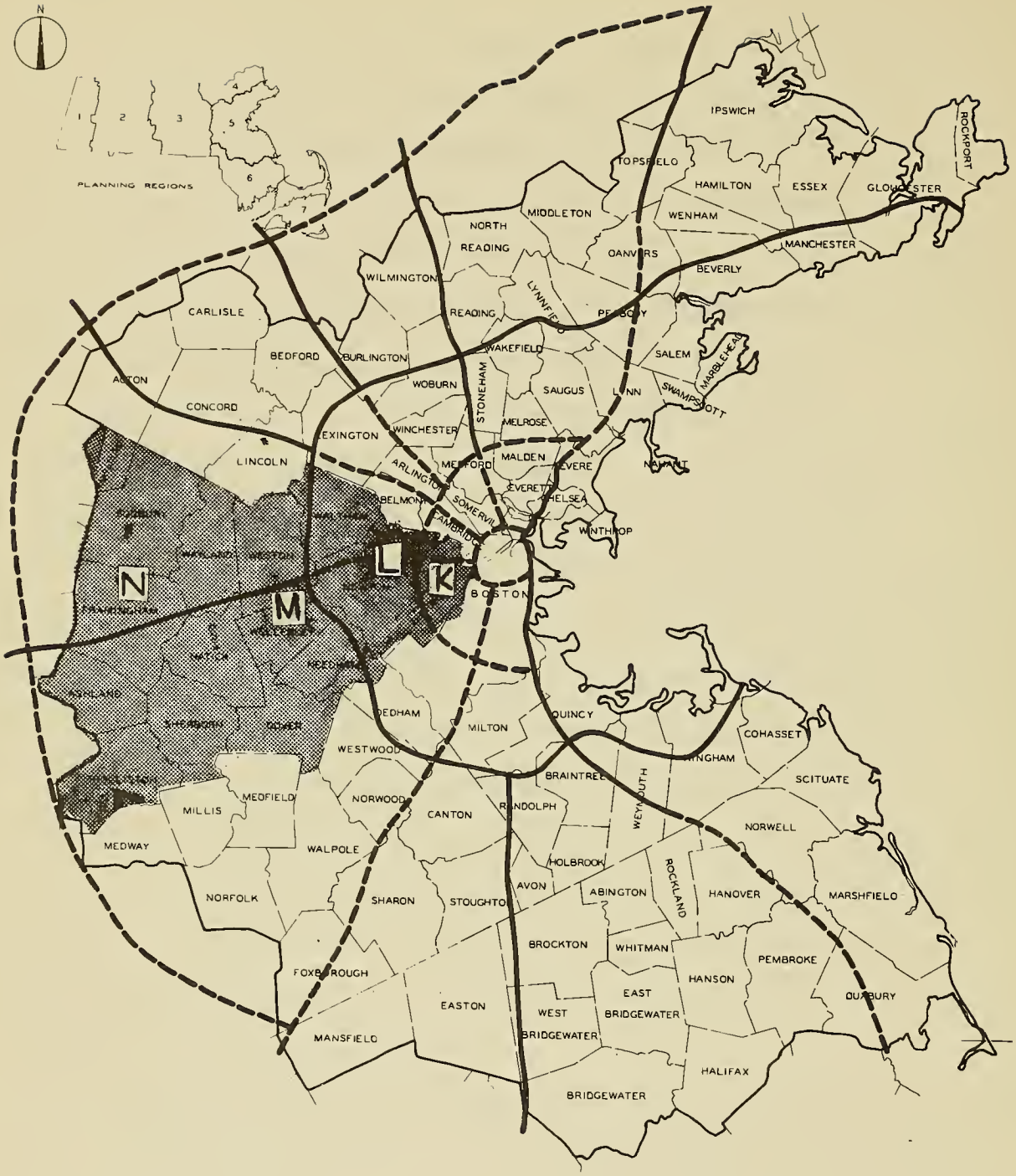
those already using the facilities;

ii Provide additional capacity in the event that railroad service is entirely eliminated;

iii Terminate at large parking areas which would attract as high as 25% of the new riders;

iv Be fully coordinated with the designs of both Inner and Intermediate Belts, to allow patrons access to the parking areas.

5. Since there is no expressway facility in this area between the Inner Belt and Downtown, and because of the congestion to be expected in the near future, traffic controls should be improved and maintained on the major streets of this area, particularly on the Route 2 - Storrow Drive - Memorial Drive - Longfellow Bridge combination, and on the Northern Artery - Charles River Dam combination.



MAP XVII

REGIONAL BOSTON - WESTERN SECTOR

IV The Western Sector

This sector incorporates the communities from the Fens area of Boston west through Newton and Framingham. The area extends from Waltham on the north to Needham and Dover on the south; and from Sudbury on the north to Ashland on the south. (See Map. XVII opposite.)

This sector is now served by Route 9 (the Boston-Worcester Turnpike), the Storrow Drive-Nonantum Road combination, and the Massachusetts Turnpike from Route 128 west. In addition, the MTA Highland Branch PCC line to Riverside and the Boston and Albany Mainline now provide mass transportation service to Downtown Boston.

It had been expected that an expressway in the form of a tollroad extension would be constructed from the present terminus of the tollroad to Downtown Boston. However, the recent announcement of the Turnpike Authority of its inability to float the necessary bonds to pay for this extension, has revived the possibility of construction of a freeway from Route 128 to the Inner Belt in the vicinity of the Boston University Bridge.

SECTION AK

Section AK is equivalent to radial facilities between Downtown Boston and the Fens-Brighton-Brookline area. Storrow Drive and a number of major streets now handle this traffic (as well as much of the traffic bound for the Northwest and Southwest sectors.) This section would have been equivalent to that part of the proposed extension of the Massachusetts Turnpike, from the Inner Belt to the South Station Area.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		51,000
Capacity:	6 lane Expressway	90,000 to 120,000
	Local facilities	15,000 to 20,000
	Total Capacity	105,000 to 140,000
1980		
Assigned Volumes		100,000
Capacity:	6 lane Expressway	90,000 to 120,000
	Local facilities	15,000 to 20,000
	Total Capacity	105,000 to 140,000

These figures indicate that although there is currently a deficit of travel space upon entering the Downtown area from the west, it is not as great as the deficit from other sectors of the region, nor great enough at this time to use much more than one-half of the capacity of this section of a new expressway, assuming the existence of the Inner Belt. In addition, if this were to be a tollroad, and the tolls charged were too high, much of this potential traffic would continue to use local streets and highways.

The 1980 traffic volumes show that this channel would have a fair amount of future traffic. The extent of use of a tollroad, however, would still be dependent on the tolls charged, and on the location and design of access and egress facilities. The volumes on this channel are such, however, that they could be accommodated for many years just as well by improving the major highways in the area so as to increase their capacity, constructing a new major feeder street in the area and, at the same time, providing moderate capacity mass transit facilities to the west.

SECTION KL

Section KL is equivalent to an expressway between the Inner Belt in the Fens-Brighton-Brookline area and the Intermediate Belt in the Brighton-Newton area.

Major facilities now serving this area are Route 9 and Soldiers Field Road. The proposed expressway to the west would also serve this area.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	156,000
Capacity: 8 lane expressway	120,000 to 160,000
Existing major highways	25,000 to 30,000
Total Capacity	145,000 to 190,000
1980	
Assigned Volumes	284,000
Capacity: 8 lane expressway	120,000 to 160,000
Existing major facilities	25,000 to 30,000
Total Capacity	145,000 to 190,000

It can be expected that an 8 lane freeway between Newton and the Inner Belt would be used to full design capacity immediately. If constructed as a toll road, however, such use would require: (1) that tolls are not too high; (2) that there is reasonable access to the toll road; and, (3) that the toll road connect with the Inner Belt. An expressway in this area must, therefore, be considered as high priority in order to fulfill present traffic needs.

These figures indicate that by 1980, travel between the west and the Inner Belt will exceed the combined capacities of existing facilities and the planned expressway by at least 90,000 daily motor vehicle trips. A small share of this excess volume can find

space on local highways; and the space deficit could be less if car occupancy rates are higher than the assumed rate of 1.45 persons per car. However, the greatest relief of the excessive volumes will occur when the Intermediate Belt becomes a reality to divert the heavy proportions of crosstown traffic away from the inner radial routes.

In any case, it is apparent that the volumes are great enough to consider additional mass transportation service. This consideration is made all the more important by the knowledge that over 90,000 of the vehicle trips in 1980 are between downtown and areas L, M, and N. This is equivalent to 130,000 person-trips between this area (Newton, Waltham, Wellesley, etc.) and Downtown.

SECTION LM

Section LM is equivalent to a radial transportation channel between the Intermediate Belt in the Newton-Brighton area and Route 128 in Newton-Weston. The flows in this area are now served by Route 9, and in the future would be served by the expressway extension from Route 128 to the Intermediate Belt.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	160,000
Capacity: 8 lane expressway	120,000 to 160,000
Existing local facilities	20,000 to 25,000
Total Capacity	140,000 to 185,000
1980	
Assigned Volumes	305,000
Capacity: 8 lane expressway	120,000 to 160,000
Existing local facilities	20,000 to 25,000
Total Capacity	140,000 to 185,000

The 1959 volumes can be accomodated by the construction of the proposed Western Expressway. The present facilities have a capacity well below the expected present volume. Local streets currently handle some of this traffic but the more important factor is the current diversion of potential radial traffic to Route 128. Because the present radials are generally congested, traffic that has some crosstown orientation will use Route 128 even if it involves traveling first outwards, then around and then inwards again. With the completion of a good radial expressway in this area, traffic will choose the radial route over Route 128 and select the shorter trip of inwards, and then around.

It is to be recalled that these high volumes for 1959 and those shown for 1980 are assignments made to this facility assuming the entire system of expressways is in existence. Once the radial routes become fully used, other travelers will again select Route 128 and other circumferentials made available.

In 1980, there is a space deficit of at least 120,000 motor vehicle trips per day. As in the case of the 1959 situation some of this deficit can be reduced through local street capacity and higher car occupancy. However, it is strongly believed that the greatest reduction will occur because of diversion to Route 128. But as noted before, the deficits are hugh enough, and the number of trips to Downtown great enough, to justify strong consideration of some additional mass transportation facilities.

SECTION MN

Section MN is equivalent to highway facilities between Route 128 and the Sudbury-Framingham-Ashland area. These areas are now served by the Massachusetts Turnpike, Route 20, and Route 9.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		43,000
Capacity:	Toll road (6 lanes)	90,000 to 120,000
	Local facilities	25,000 to 30,000
	Total Capacity	115,000 to 150,000
1980		
Assigned Volumes		97,000
Capacity:	Toll road (6 lanes)	90,000 to 120,000
	Local facilities	25,000 to 30,000
	Total Capacity	115,000 to 150,000

There seems to be no major problem in this area either because of present or future traffic volumes. However, these figures do not include the special volumes of intercity and interstate traffic using the New York-Connecticut-Boston-Maine highway channel. Also, the capacities shown assume that there will be reasonable access to the Toll road for travelers originating in and/or destined for the western suburbs through which it passes. If the Toll road does not prove useful in this way, the more local facilities will prove very incapable of accommodating the expected volumes generated in these rapidly growing communities.

Conclusions - Western Sector

The comparisons of capacity and motor vehicle volumes indicate that an expressway between Route 128 near the Toll road's present terminus and the Inner Belt is badly needed. If designed and constructed to allow access from intermediate points as well as from the Intermediate and Inner Belts, it will be heavily used. If constructed as a tollroad, and tolls are too high, the expected use of the expressway will be less and local streets will not be adequately relieved of excessive traffic volumes. The expected volumes indicate that the expressway between Route 128 and the Inner Belt must have 8 lanes of capacity and good access to surrounding communities.

An extension of the expressway from the Inner Belt to Downtown could be expected to have light traffic volume in 1959. Such a section, even if designed for only 6 lanes, would still have excess capacity. Some of this excess space might be utilized by traffic from the Northwest and Southwest sectors, but only if the expressway to the west is joined with the Inner Belt.

A review of the assigned traffic flows indicates that the great majority of trips using this expressway have origins and destinations other than in the Downtown area. Therefore, it is imperative that the Inner Belt be constructed as soon as possible to connect with the Western Expressway so that non-Downtown travelers can circulate around the inner areas to their destinations.

In 1980 all sections of this western expressway or toll road between Route 128 and the Inner Belt will be overcrowded.

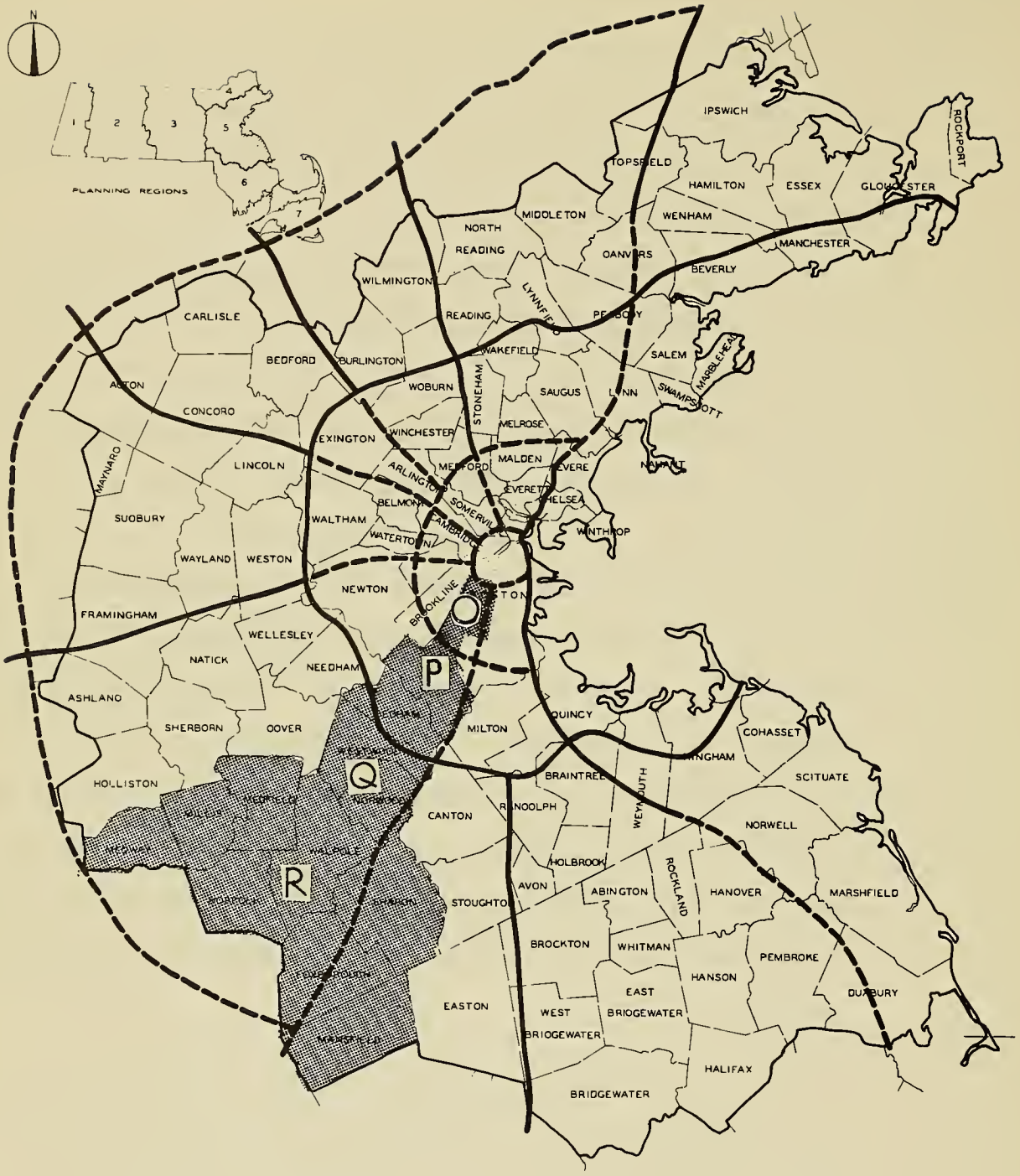
For this reason carefully designed connections with the Inner and Intermediate Belts are imperative to efficient use of this and other sections of the expressway network.

The large excess volumes of traffic on this western radial also require that additional mass transit facilities be planned for this area. Therefore, land and right of way should be preserved along the Boston and Albany Mainline all the way from Framingham to Downtown Boston. This right of way should be planned for high-speed, moderate-capacity, inexpensive mass transit facilities until such time as the design and use of the expressway extension can be evaluated in the light of experience. At that time the necessity of high-capacity transit facilities can be determined with greater accuracy.

This study feels that high-capacity mass transit facilities will become justified in the near future, and by 1980 the volume of passengers making use of mass transportation facilities from this area will be at least 20,000 riders more than now use mass transit from this sector.

Recommendations - Western Sector

1. Construction should be undertaken immediately of a limited-access expressway from the present terminus of the Massachusetts Turnpike in Weston to the Inner Belt in Brighton.
2. The design of this extension should provide complete expressway interchanges with the Inner Belt and the Intermediate Belt.
3. Extension of the Western Expressway from the Inner Belt into Downtown Boston is of low priority because of the low level of traffic volumes.
4. Further study should be made of the costs and benefits of a moderate capacity mass transportation facility connecting Framingham, Wellesley, Newton and Brighton with Downtown Boston. A final decision on the type and design of mass transit through this area should await completion of the design of the expressway extension. In any event, however, the magnitude of travel in this sector requires that a two-track right of way be preserved.
5. Because the expected volumes in this sector will exceed the capacity of an expressway extension, all existing major highways should be maintained as high-capacity facilities, and consideration should be given the construction of an additional feeder street into Downtown from the Inner Belt area.



MAP XVIII

REGIONAL BOSTON - SOUTHWEST SECTOR

V. The Southwest Sector

The Southwest sector of the Boston region is shown on Map XVIII opposite. It is one of the smallest of the sectors, having a 1960 population of 372,496. The sector extends from Roxbury through the Jamaica Plain-West Roxbury section of the City of Boston thence to the Walpole-Medway-Millis area.

This sector is now served by major streets, with the Jamaicaway, Veteran of Foreign Wars Parkway, and Route 1 being the radial combination with the greatest motor vehicle capacity. Washington Street from the very heart of Downtown Boston extends nearly the full length of this sector but is used primarily for local and shorter distance travel.

The radial facility with the greatest capacity is the Forest Hills Rapid Transit line. For years this facility has been the subject of discussion. Attempts have repeatedly been made to remove it from its elevated position to the New Haven railroad tracks or to a subway position - and then extend it to Roslindale, West Roxbury and Dedham or Needham.

The New York, New Haven and Hartford Railroad mainline bisects this sector. In the past, this railroad route carried substantial numbers of commuters but the curtailment policies of the commuter railroads have caused the number of commuter users of this service to decrease.

Present highway plans are to construct a limited access expressway the entire length of this sector from the Inner Belt

ultimately to the Rhode Island state line. This expressway is Interstate Route 95 and as such will be the last section of a New York, Connecticut Turnpike, Boston, New Hampshire and Maine Interstate channel. Plans for much of this highway have been completed.

SECTION AO

Section AO is equivalent to a radial channel between Roxbury and Downtown Boston. There is no expressway currently serving this flow, nor is any expressway planned.

The expressway system is so designed that longer distance motor vehicle flow from the Southwest sector must gain access to the Downtown area by traveling along the Southwest Expressway to the Inner Belt and then along the Inner Belt to the Central Artery. As will be seen in the analysis of the Southeast Expressway, the flows from the Southeast sector will consume all of the space on the Central Artery, making it extremely difficult for flow from this sector to gain access during peak hours.

Existing facilities serving this flow include Brookline Avenue, Huntington Avenue, Tremont Street, Columbus Avenue, Shawmut Avenue, and Washington Street - all four or six lane major streets with numerous traffic signals and on-street parking that materially reduces traffic capacities. The Forest Hills rapid transit line serving this channel has a far greater capacity for the longer distance travelers than all these streets combined.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	35,000
Capacity: All major streets	30,000 - 35,000
1980	
Assigned Volumes	55,000
Capacity: All major streets	30,000 - 35,000

The figures above indicate that, while current volumes use the full capacity, the increased future volumes will cause a deficit in capacity. It cannot be expected that the entire 1980 space deficit of 20,000 to 25,000 motor vehicles per day can be handled by diversion to the Inner Belt and Central Artery. During the off-peak hours these diversions can take place; but during peak hours it will be impossible. Other arrangements will be necessary.

The obvious solutions are improved major street capacities and/or greater use of the rapid transit facilities. Improvement of the major street system in this area represents a good possibility in view of the fact that the Inner Belt through Roxbury will induce many thousands of crosstown trips off the surface streets so that they will not conflict with radial traffic or local traffic.

Greater use of the Forest Hills rapid transit line represents a logical solution to part of this problem, particularly in view of the relatively high proportion of Downtown-bound travelers from this sector. Unfortunately, the rapid transit line now terminates at Forest Hills, short of the origins of many travelers.

SECTION OP

Section OP is equivalent to a radial facility between the Inner Belt in Roxbury and the Roslindale-West Roxbury-Hyde Park areas of the City of Boston. The Southwest Expressway is planned for early construction in this area. The existing facility serving this flow is the Jamaicaway-Arborway-Veterans of Foreign Wars Parkway combination.

Daily Motor Vehicles Volumes	
1959	
Assigned Volumes	122,000
Capacity: 8 lane Southwest Expressway	120,000 - 160,000
Major streets	20,000 - 25,000
Total Capacity	140,000 - 185,000
1980	
Assigned Volumes	230,000
Capacity: 8 lane Southwest Expressway	120,000 - 160,000
Major streets	20,000 - 25,000
Total Capacity	140,000 - 185,000

It is apparent from the figures above that the capacity of existing facilities is well below that required to handle present traffic needs and that the Southwest Expressway when completed in this area and connected to the other parts of the network will be used to almost full design capacity.

By 1980, the volumes of motor vehicles attempting to use these radial facilities will greatly exceed their capacity by at least 45,000 motor vehicles per day.

The present plans to improve the Jamaicaway will relieve this situation somewhat and remove a number of safety hazards.

SECTION PQ

Section PQ is equivalent to radial facilities between the Roslindale area and the Dedham-Westwood area, or the Southwest Expressway between the Intermediate Belt and Route 128. The major facilities now serving this traffic flow are Washington Street and the Veterans of Foreign Wars Parkway leading to Route 1 in Dedham. The rapid transit line terminates at Forest Hills and, therefore, does not adequately serve these radial volumes.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	80,000
Capacity: 8 lane Southwest Expressway	120,000 - 160,000
Major streets	20,000 - 25,000
Total Capacity	140,000 - 185,000
1980	
Assigned Volumes	178,000
Capacity: 8 lane Southwest Expressway	120,000 - 160,000
Major streets	20,000 - 25,000
Total Capacity	140,000 - 185,000

These figures indicate that once the Southwest Expressway is completed in this area there will be enough capacity to handle present and future traffic volumes. The amount of traffic to use the Southwest Expressway as a connector between Boston and Providence and beyond is not included in any of these assigned traffic volumes. Therefore, actual use will be greater than the volumes shown.

SECTION RQ

Section RQ is equivalent to Route 1 and the Southwest Expressway between Route 128 and the Walpole-Foxboro area, where ultimately the Outer Belt will be constructed as the southern half of Route 495 now under construction in the Lowell-Lawrence area. Route 109 into Westwood and points south also now serves part of this sector.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		60,000
Capacity:	6 lane Southwest Expressway	90,000 - 120,000
	Major highways	25,000 - 30,000
	Total Capacity	115,000 - 150,000
1980		
Assigned Volumes		95,000
Capacity:	6 lane Southwest Expressway	90,000 - 120,000
	Major highways	20,000 - 25,000
	Total Capacity	110,000 - 145,000

It can be seen that the capacity of the existing major highways and the new Southwest Expressway will be more than adequate to handle the longer distance trips in this outer section of the region. The volumes on these facilities will actually be greater than the assignments shown because of the inter-regional travel from southern New England and New York which will approach metropolitan Boston on this route.

Conclusions - Southwest Sector

Without an expressway, the radial traffic movements in the Southwest sector are bad and the users of highways in the area will find increasing amounts of traffic congestion.

Once the Southwest Expressway is completed between Route 128 and the Inner Belt, it will be fully used to eight lane design capacity. Well before 1980, the section of the expressway closest to the Inner Belt will be overloaded. Contributing to the use that can be expected of it will be motor vehicle flow from parts of the Southeast Sector which, as is discussed later, has a serious current deficit in capacity.

Because the Southwest Expressway will not extend directly into Downtown Boston it will be natural for much traffic with Downtown destinations to move onto the Inner Belt to the Central Artery. This will add to the existing congestion on this section of the Central Artery by motorists using the Southeast Expressway.

It will be necessary to provide alternative routes by improvement of the major street system and by extension of the Forest Hills rapid transit line of the MTA. Improvements to major streets are necessary to provide additional capacity of approximately 10,000 motor vehicles per day. This additional capacity must be provided on those major streets that can be connected to the Southwest Expressway and lead directly to Downtown Boston. Access between the Southwest Expressway to the improved major streets should be provided before the Southwest Expressway joins with the Inner Belt, thereby

avoiding unnecessary congestion with very heavy Inner Belt traffic flows.

Extension of the Forest Hills rapid transit line is necessary to accommodate at least an additional 10,000 person-trips per day. It is only possible for this line to handle additional riders if it is extended to areas of commuter residence in West Roxbury and Roslindale; and to large parking lots provided at the outlying terminals. The long-discussed possibility of an extension to Roslindale, West Roxbury, and at least to large parking areas along Route 128 in Needham or Dedham, is fully justified and required. Such facilities will aid considerably in alleviating the expected congestion on the Southwest Expressway just south of the Inner Belt, and will provide necessary and good access to Downtown.

Of particular importance to the location and design of the Southwest Expressway are the growing transportation problems in the Southeast Sector immediately adjacent to the east. The magnitude of these travel problems are described in detail below. The location and design of the Southwest Expressway should aid the movement of people from some parts of the Southeast Sector, especially the Canton, Sharon and Stoughton area. Again,the creation of an Intermediate Belt stands out in importance as a route providing connection between the Southeast Expressway and the Southwest Expressway.

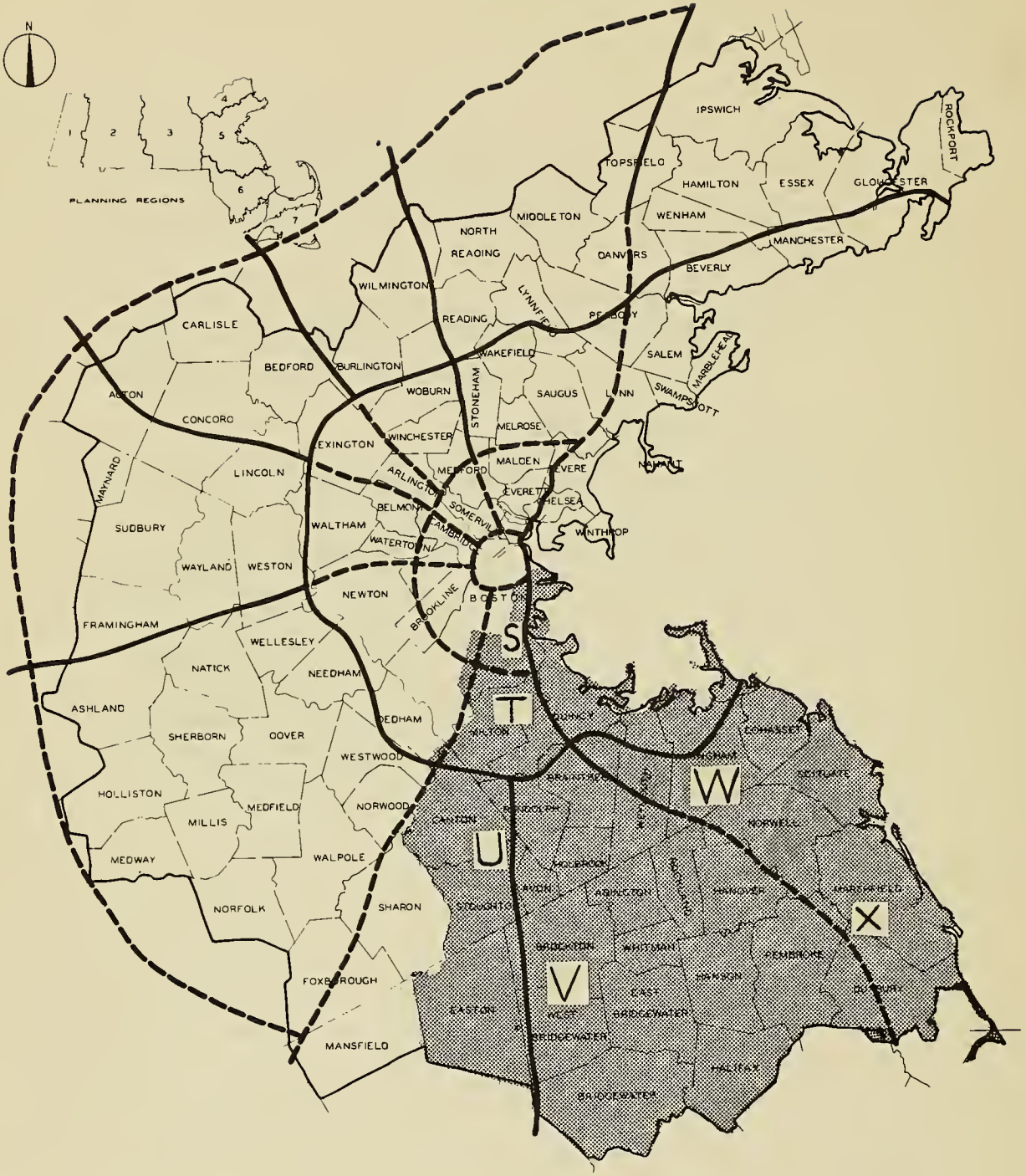
Recommendations - Southwest Sector

1. The Southwest Expressway is a high priority project and should be under construction as soon as possible.
2. The Southwest Expressway should be constructed as an eight-lane facility between the Inner Belt and Route 128.
3. The Southwest Expressway should be so located and designed as to enable traffic from some parts of the Southeast sector to use it conveniently because of the extremely heavy traffic flows expected on the Southeast Expressway.
4. Major street improvements in the Roxbury area should be undertaken simultaneously with the construction of the Southwest Expressway to provide access for Downtown-bound motorists from the Southwest Expressway. These improvements should be designed in conjunction with access ramps of the Expressway located south of the Southwest Expressway-Inner Belt connection.
5. The Jamaicaway reconstruction project is fully justified and should be carried out along with traffic control improvements to the Brookline Avenue and Huntington Avenue approaches to Downtown Boston.
6. The Forest Hills rapid transit line should be extended along the New Haven right-of-way through the heavily populated areas of West Roxbury and Roslindale. In

addition, a feasibility study should examine the relative cost and benefits of the following alternatives:

(a) Extending this rapid transit line beyond West Roxbury, past Route 128 into Needham or Dedham; or,

(b) Extending the line beyond West Roxbury to Route 128 and providing large, well-developed off-street terminal parking areas with access to Route 128. (This latter alternative could well prove to be the least expensive way of adequately serving the Dedham-Needham area.)



MAP XIX

REGIONAL BOSTON - SOUTHEAST SECTOR

VI The Southeast Sector

The Southeast sector of the Boston Region is shown on Map XIX opposite. This sector is the largest of the six delineated in this analysis, with a population of 679,156 persons in 1960. Of primary influence upon the traffic flows in this area is the high rate of growth expected in this region. Because of the attractiveness of the South Shore, the 1980 population for this sector is estimated to be 835,300, an increase of 23% over 1960.

This sector is currently served by the Southeast Expressway, Morrissey Boulevard, the Fall River Expressway and a number of major highways. Mass transportation facilities in use are the Dorchester line of the M.T.A. which terminates at Ashmont, the Mattapan PCC Line which connects with the Ashmont rapid transit line, and a number of private bus lines that provide service into Downtown Boston.

The current transportation conditions in this sector stand out for two reasons:

1. The Old Colony Division of the New York, New Haven, and Hartford Railroad has discontinued commuter service to Quincy and areas south;
2. Shortly thereafter the Southeast Expressway was opened and immediately used to full capacity.

The intervening months have seen little progress in easing the commuting problems in this area. Although many attempts have been made by numerous agencies and officials, a solution has not been reached regarding future plans and policies to relieve traffic in this area.

SECTION AS

Section AS is a radial channel connecting Downtown Boston directly with the Dorchester section of the City of Boston. In reality this is the southern half of the Central Artery and the very northern part of the Southeast Expressway.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	165,000
Capacity: Southeast Expressway	90,000 to 120,000
Major Streets	25,000 to 30,000
Total Capacity	115,000 to 150,000
1980	
Assigned Volumes	225,000
Capacity: Southeast Expressway	90,000 to 120,000
Major Streets	25,000 to 30,000
Total Capacity	115,000 to 150,000

The comparison of 1959 capacities and assigned volumes demonstrates the congestion that exists each day on these facilities. The figures show a current deficit of space of 15,000 motor vehicles per day.

By 1980 there will be a space deficit equivalent to 75,000 motor vehicles per day. Yet these figures do not include those vehicles attempting to enter upon the Central Artery from the Southwest Expressway.

The sheer magnitude of these expected volumes indicates that substantial improvements in the form of streets, highways and/or transit are vital to continued access between Downtown and the South Shore.

SECTION TS

Section TS is equivalent to radial facilities from Neponset River to the Inner Belt through Dorchester. The only major facilities now serving this area are the Southeast Expressway and Morrissey Boulevard. Other low-capacity facilities in the area are Dorchester Avenue and Blue Hill Avenue.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		212,000
Capacity:	Southeast Expressway	90,000 to 120,000
	Morrissey Boulevard	25,000 to 30,000
	Total Capacity	115,000 to 150,000
1980		
Assigned Volumes		325,000
Capacity:	Southeast Expressway	90,000 to 120,000
	Morrisey Boulevard	25,000 to 30,000
	Total Capacity	115,000 to 150,000

This section of the Southeast Expressway, between its connection with the Inner Belt and the proposed location of the Intermediate Belt, is assigned the heaviest volumes of the entire expressway network - both in 1959 and 1980. (See Maps XII and XIII).

It is inconceivable that these volumes can be accommodated by one expressway.

In 1959 the space deficit amounted to 60,000 motor vehicles per day. In 1980 the space deficit will become at least 175,000 motor vehicles per day - or the equivalent of another 8 lane limited access expressway.

SECTION TU

Section TU is equivalent to a radial transportation channel between the Quincy-Milton area and the Randolph-Stoughton-Canton area. This traffic flow is now served by the combination of the Fall River Expressway and Route 128 feeding into the Southeast Expressway. Route 138 also serves this area as a major street feeding into Blue Hill Avenue. There are no major mass transportation facilities serving this area.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	58,000
Capacity: Fall River Expressway - Route 128- Southeast Expressway channel	90,000 - 120,000
1980	
Assigned Volumes	86,000
Capacity: Fall River Expressway - Route 128- Southeast Expressway channel	90,000 - 120,000

This section of these radial facilities is adequate to handle both 1959 and 1980 traffic. The analysis above, however, does not account for those trips that will divert onto the Southwest Expressway because of the greater congestion on the inner parts of the Southeast Expressway. As such diversions occur, congestion on the inner parts of the Southeast Expressway will be eased somewhat.

SECTION UV

Section UV connects the Canton-Randolph-Stoughton Area with the many communities in the Brockton-Bridgewater region. The fall River Expressway is available to serve this traffic.

Daily Motor Vehicle Volumes	
1959	
Assigned Volumes	47,000
Capacity: Fall River Expressway	90,000 - 120,000
1980	
Assigned Volumes	68,000
Capacity: Fall River Expressway	90,000 - 120,000

The assignments of daily motor vehicle trips in this area can easily be handled by the Fall River Expressway for many years to come.

SECTION TW

Section TW is a radial channel (with some circumferential orientation) between the Quincy-Milton area and the Braintree-Weymouth-Hingham area (See Map XX .) The traffic volumes in this area are served by the Southeast Expressway and the regional highway Routes 3 and 3A. The discontinuance of the Old Colony line has left this area with no mass transit facilities.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		120,000
Capacity:	Southeast Expressway	90,000 to 120,000
	Major Streets	15,000 to 20,000
	Total Capacity	105,000 to 140,000
1980		
Assigned Volumes		250,000
Capacity:	Southeast Expressway	90,000 to 120,000
	Major Streets	15,000 to 20,000
	Total Capacity	105,000 to 140,000

These values demonstrate the problem as it exists in practice each day. The Southeast Expressway and the major street system of this area are used to beyond full design capacity.

The numbers indicate a continuing growth in this traffic flow to the extent that by 1980 the expressway and major street system will have a capacity deficit of at least 110,000 daily motor vehicle trips.

The heavy volume from this area is an influential factor upon the excessive volumes of traffic on inner portions of the Southeast Expressway.

SECTION WX

Section WX connects the Braintree-Weymouth-Hingham area with the Marshfield-Pembroke-Duxbury area. The area is now served by regional highway Routes 3 and 3A. Eventually, plans call for the Southeast Expressway to be extended as a limited access expressway to meet with the Plymouth by-pass and expressway to Cape Cod.

Daily Motor Vehicle Volumes		
1959		
Assigned Volumes		59,000
Capacity:	Extended Expressway	90,000 to 120,000
	Major Streets	35,000 to 45,000
	Total Capacity	125,000 to 165,000
1980		
Assigned Volumes		135,000
Capacity:	Extended Expressway	90,000 to 120,000
	Major Streets	25,000 to 30,000
	Total Capacity	115,000 to 150,000

These comparisons show that the extension of the Southeast Expressway is rapidly becoming a necessity. Once it is completed it will have adequate capacity to handle radial traffic flows in this section. The longer the construction of this extension is delayed, the greater will be the deficits of space in this section.

The actual deficit in 1959 is some 15,000 vehicles per day. If the extension weren't constructed, the deficit by 1980 would amount to over 100,000 vehicles per day.

Conclusions - Southeast Sector

The Southeast sector is the largest sector in the Boston region. It has had the highest rate of population growth and, consequently, travel demands generally exceed the capacities of highway and transit facilities available to residents of the sector.

The traffic volumes shown above are predicated in part upon a continued high rate of growth. In fact, it is probable that the rate of growth of population may well exceed that estimated in previous volumes of this series. It is also to be noted that weekend summer travel to points along the South Shore and Cape Cod is not specifically accounted for. These influences will cause the traffic volumes to be greater than shown. However, as this area develops commercially, providing greater amounts of local employment, this congestion will be alleviated somewhat, since fewer work trips will be made from the area.

The comparisons of 1959 and 1980 volumes and capacities show that only the area served by the Fall River Expressway has adequate facilities. The southernmost part of this sector nearest the Atlantic Ocean will soon require an extension of the Southeast Expressway - particularly to serve the increasing amounts of weekend travel.

The real problems of this sector are between the Hingham-Weymouth area and Downtown Boston. These problems are current and are greater than encountered in any other radial channel leading to the inner core of the Region. The two radial sections from Downtown Boston to the Inner Belt, and from the Inner Belt to the location of an Intermediate Belt at the Neponset River have present

space inadequacies of at least 15,000 and 60,000 motor vehicles daily.

By 1980 these two sections of the Southeast Expressway and the next section from the location of the Intermediate Belt to Route 128 will have capacity deficits of at least 75,000, 175,000 and 110,000 motor vehicle trips per day. As in the case of all radial routes, the heaviest flow is on the section of the expressway just outside the Inner Belt.

These excessive flows will be difficult to contend with. In the first instance they will become somewhat reduced by the transportation difficulties; i.e., many of the trips will not occur because of the unavailability of facilities. Secondly, the expected long-range growth of commercial enterprise in the Southeast sector could divert many of these trips from other areas of the region. Thirdly, some of the trips will be diverted around the inner parts of the region rather than through it on Route 128, the Intermediate Belt, and the Inner Belt. But despite these influences, the volumes of trips show a distinct need for substantial additional capacity.

It will be necessary, in the immediate future, to undertake construction of the Inner Belt in this area to relieve the Central Artery, and to undertake construction of the Intermediate Belt to help relieve the Dorchester Section of the Southeast Expressway. In addition, it is of the utmost importance that Morrissey Boulevard-which has recently been rebuilt-be maintained as a high capacity facility and be given much better connections to Downtown Boston through the South Boston-Fort Point Channel area.

The flows of traffic along the Southeast Expressway itself will require that additional facilities be constructed to allow additional entrance into the Downtown area before traffic flows approaching Downtown on the Expressway and Inner Belt become merged. Therefore, access ramps to and from the Southeast Expressway to a better developed major and feeder street system in the South Bay-Fort Point Channel area are a necessity. This type of solution appears to be an absolute must to serve Downtown Boston and any future development of the South Bay area. This problem is much the same as that in the North Terminal area.

All of the highway improvements mentioned above are designed to maximize utilization and flow of motor vehicle traffic along the radial routes from the Southeast. However, all of these highway improvements do not solve the great deficit in transporta- capacities from this area-neither those that exist and certainly not those of the future.

The conclusion is unavoidable that high-speed, high-capacity rapid transit must serve this area, and soon. The volume of travel and assignment of trips indicates that a rapid transit line to Quincy and Braintree, with many off-street parking facilities, must be designed to carry an absolute minimum of 25,000 riders to and from downtown Boston at the present time. By 1980 the number of riders to and from Downtown Boston will become near 50,000 - 60,000. These volumes will require high-speed high-capacity facilities greater than that available in railroad-type equipment. (A total of 60,000 additional mass transit passengers is equivalent to over 40,000 motor vehicle trips that need not use the expressway.)

Recommendations - Southeast Sector

1. A high-speed, high-capacity mass transit facility between Downtown Boston and parking areas in Braintree should be constructed and put into operation immediately. This facility should be designed to accommodate an eventual 1980 volume of at least 50,000 daily passengers. Since the expected volume of riders is greater than the capacity provided by standard railroad equipment or Budd cars, the type of high-speed equipment used on the M.T.A. should be employed on this line.
2. The Inner Belt should be constructed as soon as possible to help divert much of the through traffic originating in this sector away from the Central Artery.
3. Planning for and construction of the Intermediate Belt should begin as soon as possible to divert radial traffic away from the Dorchester section of the Southeast Expressway and Morrissey Boulevard.
4. Morrissey Boulevard, Blue Hill Avenue, and Dorchester Avenue should be continually maintained as vital major access roads to Boston. A consistent level of capacity between each of these facilities and Downtown should be provided.
5. A much improved system of major and feeder streets should be designed and constructed to connect the Southeast Expressway and the Downtown area. These streets should be designed to induce motor vehicles off the Southeast Expressway before it connects with the Inner Belt and Central Artery. In addition, these streets should be

designed to induce motor vehicles off the Southeast Expressway before it connects with the Inner Belt and the Central Artery. This design should be integrated with plans for development in the South Bay Area, in much the same manner as the objectives of the North Terminal Area Study on the opposite side of Downtown Boston.

6. The extension of the Southeast Expressway should be constructed as planned to connect with the South Shore and Cape Cod.

APPENDIX

MAP XX

REGIONAL BOSTON, TRAVEL ASSIGNMENT LEGS

PROCEDURE OF TRAFFIC ASSIGNMENT AND ANALYSIS

The process of using basic origin and destination data for evaluating the need for transportation facilities is an area of traffic analysis fraught with possibilities of error and omission. It is possible to assemble the individual linkages in a variety of ways, each combination demonstrating the need for a differently-located transportation facility. To show the rationale for the location of facilities resulting from this study, the procedures of assignment and analysis are herewith set forth.

Every metropolitan area and every traffic study has an initial but very significant decision that must be made before any reasonable assignment and evaluation of traffic data can be made. This is the question: How far does the community wish to go in serving the travellers of the region? How efficient, how convenient shall travel be made? The other side of the question is: How much money does the community wish to spend? At the very outset these questions resolve down to what percentage of the total trips is to be assumed as expressway traffic, rather than forced to use local streets. Or, what length of trips - as an average - are to be assigned to expressways? Should it be those 40 minutes or longer, or those of 30 or 20 minutes? A difference of 5 or 10 minutes can make the difference between the need for a highway immediately or a postponement for a few

years.

This study reviewed the practices and recommendations of other major traffic studies, and policy statements of state and federal agencies to solve this problem. There seems to be a general consistency of assigning to expressways all travel that exceeds 20 to 25 minutes in length, or the equivalent in mileage. Thus, some 25-30% of the total number of trips in an area, or approximately 40-45% of the total trip-miles or trip-minutes, are so assigned.

After careful review, this study has assigned to major facilities all trips made throughout the entire region except:

a. those made entirely within a traffic zone(intra-traffic area trips); and,

b. those made between adjacent traffic areas(except where noted.

Intra-traffic area trips are the shortest trips in the metropolitan area. They average only 3 miles in length and 14 minutes in time. The longest possible intra-traffic area trip would occur in the larger suburban traffic zones. These would average about 15 miles or 33 minutes. While it is possible that a very small portion of these trips could use expressway facilities if their origin and destination were located next to access and egress ramps, it is unlikely that excluding these short trips causes any serious error.

Through the removal of both intra-traffic area trips and adjacent traffic area trips, some 75% of all trips and 55% of all trip-minutes have been eliminated from expressway use. The remainder have been assigned to expressways.

The fact that larger traffic areas exist in the suburbs would suggest that a far greater proportion of suburban trips are thus eliminated from expressways than are those in the smaller inner areas. However, due to differing characteristics of suburban trips (compared to urban trips), a smaller proportion are eliminated by this process. Therefore, it can be said that the procedure adopted here does not eliminate a disproportionate share of trips from one area over another. A review of all the implications of this methodology, and comparisons with other studies throughout the country lends assurance that the assignments here are reasonable.

It can be expected that actual flows on sections of the expressway system will exceed the expected flows resulting from assignment of these remaining origins and destinations. This will occur at places where, for one reason or another, adequate local facilities do not exist to handle local intra-area and adjacent traffic area trips. This effect will be particularly noticeable where rivers and railroad rights-of-way interfere with the regular street pattern.

The use of expressways or other high-speed facilities by those making short trips is an important and difficult factor in highway planning and expressway design. Expressways must be preserved for the longer distance traveller. Normal events will generally lead to this situation. The shorter distance traveller will more easily accede to use of local streets.

However, the situation can be greatly aided by judicious design of access and egress ramps, located with the intent of forming new or different traffic patterns, rather than only trying to relieve existing bottlenecks. In the future it may well become highway planning policy to eliminate access ramps to expressways to insure that space is conserved for those who need it most.

Walk Trips

Since walk trips were added during the Gravity Model computation phase of this study,[1/] it was necessary to account for their elimination. It has been assumed that walk trips have been automatically taken out of the O&D linkages through the elimination of intra-traffic area volumes, since the majority of walk trips are by nature of this type. If not, then they certainly are eliminated by the subtraction of adjacent traffic area trips and are not, therefore, any further problem.

Transit Trips

In order to evaluate highway flows and needs, estimates of rapid transit flows were also subtracted from the O&D volumes. To accomplish this, records and reports of the M.T.A. and the railroads were reviewed for general patterns of passenger flows.

It was found that some 50% of all mass transportation riders are bound to or from Downtown Boston, and an additional 15-20% travel through Downtown. In addition, the majority of the remaining riders are those who make short trips (intra-area or adjacent-area trips). These figures show, then, that the great majority of longer-distance mass transit riders have origins or destinations in Downtown.

1/ See Travel in the Boston Region - Vol. II, p.14.

Briefly, then, the procedure has been as follows:

1. The origin and destination figures were reduced by excluding short trips, walk trips, and transit trips, all three of which are not normal users of expressways.
2. The remaining trips were assigned to a network of transportation channels and adjusted to include non-home based trips, truck driver trips, and external trips.
3. The resulting figures were then converted from person-trips to motor vehicle trips.
4. The number of motor vehicle trips were then converted into two-directional flows.
5. These flows were then analyzed for location of facilities where expected use exceeds present capacity.
6. A special analysis was made of transit and Downtown conditions, and highway volumes were adjusted as required.